2017-03

The role of schools and their capabilities to ensure safe sheltering during a storm

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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

THE ROLE OF SCHOOLS AND THEIR CAPABILITIES TO ENSURE SAFE SHELTERING DURING A STORM

by

Donalyn A. Dela Cruz

March 2017

Thesis Co-Advisors: Glen Woodbury
Lauren Fernandez

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REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704-0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.			
1. AGENCY USE ONLY ***(Leave blank)***	**2. REPORT DATE** March 2017	**3. REPORT TYPE AND DATES COVERED** Master's thesis	
4. TITLE AND SUBTITLE THE ROLE OF SCHOOLS AND THEIR CAPABILITIES TO ENSURE SAFE SHELTERING DURING A STORM		**5. FUNDING NUMBERS**	
6. AUTHOR(S) Donalyn A. Dela Cruz			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000		**8. PERFORMING ORGANIZATION REPORT NUMBER**	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A		**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB number ____N/A____.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.		**12b. DISTRIBUTION CODE**	

13. ABSTRACT (maximum 200 words)

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14. SUBJECT TERMS storm shelters, schools, emergency shelter, school shelters, hurricane shelters			**15. NUMBER OF PAGES** 99
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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Approved for public release. Distribution is unlimited.

THE ROLE OF SCHOOLS AND THEIR CAPABILITIES TO ENSURE SAFE SHELTERING DURING A STORM

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Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(HOMELAND SECURITY AND DEFENSE)**

from the

**NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

Across the country, public schools are more than just learning environments for students; they are designated emergency shelters in times of natural disasters, such as hurricanes, tsunamis, and tornadoes. This thesis examines the use of public schools as emergency shelters as an integral part of homeland security. It specifically addresses the experiences in the State of Hawaii and examines the practices and policies of Florida, Texas, and Japan. Through a case study of these locations, recommendations are made for the State of Hawaii regarding the practice of maintaining schools as shelters, strengthening security and safety, and clarifying its role.

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LIST OF ACRONYMS AND ABBREVIATIONS

DHS	Department of Homeland Security
DRR	disaster risk reduction
EF	Enhanced Fujita
EHPA	enhanced hurricane protection areas
EMPG	emergency management performance grant
FEMA	Federal Emergency Management Agency
GHC	Governor's Hurricane Conference
HHRF	Hawaii Hurricane Relief Fund
HIDOE	Hawaii State Department of Education
HIEMA	Hawaii Emergency Management Agency
HMGP	Hazard Mitigation Grant Program
HTA	Hawaii Tourism Authority
IBC	international building code
ICAC	Interagency Climate Adaptation Committee
ICC	International Code Council
ICS	incident command systems
MAA	mutual aid agreements
MEXT	Ministry of Education, Culture, Sports, Science and Technology
MOU	memoranda of understanding
NIMS	National Incident Management
NIPP	National Infrastructure Protection Plan
NMIA	National Mitigation Investment Act
NOAA	National Oceanic and Atmospheric Administration
NREL	National Renewable Energy Laboratory
OAG	Office of the Attorney General
OPLAN	operations plan
RFID	radio frequency identification
SOC	state operations center

SpNS	special needs shelters
SSC	school safety center
TASB	Texas Association of School Boards
TDEM	Texas Division of Emergency Management
TEA	Texas Education Agency
TxETN	Texas Emergency Tracking Network
UNISDR	United Nations Office for Disaster
USED	U.S. Department of Education

EXECUTIVE SUMMARY

During a major storm event that activates school shelters for citizens, three overarching areas require consideration: the practice of schools as shelters, the safety and security of a facility, and the role of government. This thesis brings attention to these areas, which are lacking in Hawaii, and examines cases in Florida, Texas, and Japan due to their governments dedicating public resources to ensure emergency preparation following weather events.

The analysis uses information from subject matter sources in emergency preparation and sheltering including government reports, news articles, studies, and other pertinent literature. The research identifies requirements and challenges, analyzes solutions from the case studies, synthesizes data, and applies the solutions to Hawaii. It concludes with an assessment through policy recommendations. The research reveals Hawaii's challenges in maintaining schools as shelters range from appropriate building standards and retrofitting to emergency management training for school personnel and funding.

Within the practice of schools as shelters, it was found that attention should be given to shelter criteria, as well as resources. Hawaii is lacking in these areas, whereas Florida and Japan have made them a priority by embedding criteria and resources in their laws. At least one school district in Texas has focused on establishing stronger shelter criteria in the construction and retrofitting of its schools. Hawaii should do more in adopting shelter criteria for schools and investing in appropriate expertise and resources.

When analyzing the issue of safety and security, it became evident that training is essential to prepare school officials for their role in managing their schools for sheltering. Required training is limited in Hawaii to emergency management officials and offered as a service, whereas in Texas, Florida, and Japan, training is incorporated at the school, and sometimes, community levels. Texas makes training resources available through a school safety center. Florida holds a Governor's Hurricane Conference that provides consistent training and workshops for managers to use at their organizations. In Japan, disaster-

resiliency is ingrained in its culture; evacuation drills are consistently held throughout the country.

Another area considered in the research is the existence of security background checks and medical tracking of sheltering citizens evacuees. Texas has established a process called Operation Safe Shelter, which tracks the presence of registered sex offenders and uses the Texas Emergency Tracking Network to assure that evacuating patients are accounted and cared for, providing situational awareness for shelter managers and protections for shelter users.

Florida, Texas, and Japan have prioritized these critical areas through legislation, and in some cases allocated funding for shelter criteria. Established laws provide for accountability for these assets. However, funding is an issue for Texas in meeting the building code requirements for tornado-strength protections. Hawaii has yet to establish laws for schools as shelters and the cases presented offer best practices from which Hawaii can derive and create policies and begin to give schools that become shelters the attention they deserve and need.

Further research into background check systems and the role of the American Red Cross with regard to schools as shelter management will also allow for more insight and better approaches to managing this dual purpose of schools.

ACKNOWLEDGMENTS

I wish to extend my gratitude to Superintendent Kathryn Matayoshi, U.S. Marshal Gervin Miyamoto, and former U.S. Department of Interior Assistant Secretary Esther Kia'aina for their endorsement of my candidacy for the Naval Postgraduate School's Center for Homeland Defense and Security master's program. I owe a special thanks to Christopher Bellavita and Glen Woodbury, who encouraged me to apply for this master's program during my participation in the Pacific Executive Leadership Program. For guiding me through my research and writing process, I am deeply grateful to Noel Yucuis and Lauren Wollman.

Mahalo nui loa to former U.S. Senator Daniel K. Akaka, and former Congressman and Hawaii Governor Neil Abercrombie, for their collective service to Hawaii and the nation, and their support over the years.

Finally, I wish to thank my parents for their support and love, and my brother, State Senator Donovan Dela Cruz, for his steadfast dedication to improving the conditions in our communities.

I dedicate this thesis to the late U.S. Senator Daniel K. Inouye for his service to this country and commitment to ensuring the existence of U.S. homeland security education.

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I. PREPARING FOR THE STORM

The world's population is growing and projected to reach 8.5 billion by 2030, according to the United Nations.[1] The U.S. Census Bureau estimates the U.S. population will have reached 359.4 million the same year.[2] Among its 50 states and territories, Americans live in a variety of geographic locations, which include areas vulnerable to severe weather, such as coastal cities and islands. Climate change is advancing, and the debate over its effects of is ongoing; however, many experts correlate extreme weather with climate change. Catastrophic storms are a threat to life and property, and government leaders have a responsibility to ensure that emergency preparations are in place in communities, particularly having the ability to safely shelter citizens.

For years, national leaders have been aware of the possibility of rising sea levels and increasing storm intensity. In the 2008 Climate Change in Coastal Regions hearing, Senator Jeff Bingaman of New Mexico stated, "The longevity of our infrastructure argues for us to look long-term in the planning and design of new systems. Decisions made today for the creation of new infrastructure need to occur in ways that ensure that such infrastructure is robust enough to cope with or adapt to changing climate conditions."[3] Several states must adapt to increasing natural events, particularly those in coastal regions and in states prone to hurricanes and tornadoes.

A. PROBLEM STATEMENT

U.S. federal policy only goes so far in dictating what states should do to elevate their emergency preparation status. The Federal Emergency Management Agency (FEMA) aims "to build, sustain and improve [its] capability to prepare for, protect

[1] "UN Projects World Population to Reach 8.5 Billion by 2030, Driven by Growth in Developing Countries," July 29, 2015, http://www.un.org/apps/news/story.asp?NewsID=51526#.WF2ibPPATvA.

[2] "Population Projections," accessed January 13, 2017, https://www.census.gov/population/projections/data/national/2014/summarytables.html.

[3] *Committee on Energy and Natural Resources*, 110th Cong., 1 (2008) (statement of Jeff Bingaman, U.S. Senator from New Mexico).

against, respond to, recover from, and mitigate all hazards."[4] Safeguarding citizens during extreme weather events include providing ample emergency shelter for evacuees from threatened areas. FEMA provides emergency shelter design standards for local jurisdictions.[5] States can apply for storm shelter funding through FEMA's Hazard Mitigation Grant Program (HMGP); however, the program's funds are limited.[6] This limitation makes the application process for funds competitive and presents a challenge to states that may not have the resources to complete the application process effectively.

FEMA describes community shelters as facilities that serve as temporary protective areas for varying numbers of people, anywhere from a dozen to a few hundred.[7] Schools are designed to have gathering spaces, such as cafeterias or gymnasiums, to accommodate a large number of people. Thus, schools are a natural fit for emergency shelters. However, this requires that the structural design of a school be made with consideration of its sheltering purposes. Schools must be "hardened," which means the building must be able to resist wind pressures and windborne debris impacts during a high-wind event.[8] Aside from being high-wind resistant, schools should be equipped with technical capabilities that allow for safeguards within the sheltering period and communication during a weather event.

Education facilities are a subsector of the Department of Homeland Security's (DHS) government facilities sector, one of 18 critical infrastructure divisions.[9] This thesis explores a range of safety and management issues relating to the use of schools as

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[4] "FEMA's Mission Statement," last modified June 19, 2014, https://www.fema.gov/media-library/assets/videos/80684.

[5] FEMA, *Safe Rooms for Tornado and Hurricanes: Guidance for Community and Residential Safe Rooms* 3rd ed. (FEMA P-361) (Washington, DC: U.S. Department of Homeland Security, 2015).

[6] "Hazard Mitigation Grant Program," last modified September 28, 2016, https://www.fema.gov/hazard-mitigation-grant-program.

[7] FEMA, *Community Wind Shelters* (Washington, DC: U.S. Department of Homeland Security, 2002), 2, http://www.fema.gov/media-library-data/20130726-1529-20490-3363/shelter_bkgrdr.pdf.

[8] FEMA, *Storm Shelters Selecting Design Criteria* (Washington, DC: U.S. Department of Homeland Security, 2007), 1, http://www.fema.gov/media-library-data/20130726-1604-20490-1479/ra2_storm_shelters.pdf.

[9] U.S. Department of Homeland and Security, *National Infrastructure Plan* (Washington, DC: U.S. Department of Homeland and Security, 2011), https://www.dhs.gov/xlibrary/assets/nppd/nppd-ip-education-facilities-snapshot-2011.pdf.

emergency shelters. However, the responsibility to mandate safe rooms or storm shelters in public facilities is the province of states or counties.[10] Nevertheless, few states have mandated the construction of new schools to include the storm shelter codes recommended by FEMA.

The International Code Council (ICC) developed the International Building Code (IBC), which is used in the "design, building and compliance process to construct safe, sustainable, affordable and resilient structures."[11] The IBC requires buildings in regions exposed to tornado-speed winds of 250 miles per hour to be built to withstand such wind strengths.[12] For other regions of the country, storm shelters are voluntary; however, FEMA requires all facilities that provide storm sheltering to comply with ICC 500, the standard for design and construction of storm shelters.[13]

Since most public school facilities serve a dual purpose as institutions of education and public shelters, they play a key role in protecting lives. As states make the necessary changes to build or retrofit schools to comply with storm sheltering standards, they face funding challenges. Also, states that fall outside of regions with a disproportionately high frequency of tornadoes may not have sheltering on the radar. Under DHS's National Infrastructure Protection Plan (NIPP), educational facilities have a responsibility to have comprehensive emergency management plans that mitigate risk and enhance safety.[14] What is not noted in the NIPP is the dual-purpose role that schools play as public shelters and the necessary changes to build or retrofit schools to comply with storm sheltering standards.

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[10] "Federal Emergency Management Agency, Frequently Asked Questions: Tornado/Hurricane Safe Rooms," last modified June 3, 2015, http://www.fema.gov/safe-rooms/frequently-asked-questions-tornado/hurricane-safe-rooms#Q02.

[11] "About ICC," accessed October 8, 2016, http://www.iccsafe.org/about-icc/overview/about-international-code-council.

[12] International Code Council, *Significant Changes to the IBC 2015 Edition* (Washington, DC: International Code Council, 2015), http://media.iccsafe.org/store/2015Handbook/2015_IBC_Sig_Changes-58-59.pdf.

[13] "Highlights of ICC 500–2014, ICC/NSSA Standard for the Design and Construction of Storm Shelters," last updated December 7, 2016, https://www.fema.gov/media-library/assets/documents/110209.

[14] U.S. Department of Homeland and Security, *National Infrastructure Protection Plan: Education Facilities Subsector* (Washington, DC: U.S. Department of Homeland and Security, 2011), https://www.dhs.gov/xlibrary/assets/nppd/nppd-ip-education-facilities-snapshot-2011.pdf.

In the State of Hawaii, many public schools are identified as hurricane evacuation shelters by the Hawaii Emergency Management Agency (HIEMA). When a severe hurricane or tsunami strikes Hawaii, emergency shelters are essential for coastal residents and visitors. Hawaii is home to 1.4 million residents[15] and up to 835,000 monthly visitors.[16] During times of severe weather or tsunami warnings, visitors and residents in coastal areas are evacuated, and all people are advised to go to the nearest shelter.

Policies are needed to ensure these facilities meet requirements for evacuation shelters. Hawaii Building Code rules date back to the adoption of the 2012 IBC.[17] However, a September 2016 Hawaii Business Magazine story noted:

> ambiguous language in Hawaii's current code fails to fully communicate some requirements, potentially putting buildings and their occupants at greater risk. More concerning, many Hawaii homes were built under even older, less stringent codes. Older commercial buildings, schools, and other structures were built to higher standards than homes yet might fail to meet more modern standards.[18]

A facility issue was brought to the forefront when on February 9, 2015, wind gusts reached 60 miles an hour and obliterated portions of the roof of an elementary school cafeteria, alerting officials that Hawaii school facilities may not be properly equipped to serve as shelters.[19]

B. RESEARCH QUESTION

This thesis asks the question, what practices and policies can help Hawaii improve its use of schools as public shelters during severe weather? In the practice of

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15 "Current Population Demographics for Hawaii by Age, Gender, and Race," accessed July 26, 2016, https://suburbanstats.org/population/how-many-people-live-in-hawaii.

16 "Visitor Highlights," October 7, 2016, http://www.hawaiitourismauthority.org/research/research/visitor-highlights/.

17 Hawaii Department of Accounting and General Services, *Hawaii Administrative Rules* (Honolulu, HI: Hawaii Department of Accounting and General Services, 2012, https://ags.hawaii.gov/wp-content/uploads/2012/09/ProposedStateBuildingCode-20160613.pdf.

18 Noelle Fujii, "Storm Warning," Hawaii Business, September 2016, http://www.hawaiibusiness.com/storm-warning/.

19 Chelsea Davis, "Classes Canceled after High Winds Damage Windward Oahu School," *Hawaii News Now*, February 9, 2015, http://www.hawaiinewsnow.com/story/28065739/classes-canceled-after-high-winds-damage-windward-oahu-school.

using schools as public shelters, this thesis: (1) presents practices and policies that exist, (2) analyzes challenges and solutions, and (3) explores government oversight.

C. LITERATURE REVIEW

The literature review includes analysis of current guidance, reports, and related government policies in emergency shelter preparedness. Sources consulted include a study on the condition of schools, federally recommended shelter building codes and designs, FEMA's guidelines and recommendations, and management-system models from Florida, Texas, and Japan. Areas explored for this review include schools as shelters, safety and security issues, and the role of government. Additionally, while the literature review does not delve into the science on climate change, a discussion on disaster risk reduction based on climate impacts has been included in the role of government section.

1. Schools as Shelters

The Department of Defense's Office of Civil Defense has recognized the value of schools as shelters. In 1962, it published the *Professional Guide Series: Incorporation of Shelter into Schools*, which addresses the threat of nuclear radiation by suggesting fallout shelter designs for schools. The publication notes the economic benefit that school facilities provide, "Since the area is in constant use, the various systems serving it will be constantly maintained and kept in first class operating condition. In addition, shelter occupants, whether from the school or the community, will not have to become accustomed to unfamiliar surroundings, equipment or administrative personnel."[20] For these reasons, schools have remained ideal locations for public shelters during emergencies.

A 1999 report based on a survey conducted by the National Center for Educational Statistics for the U.S. Department of Education (USED) also acknowledges that schools are designated as evacuation centers in times of natural hazards, such as hurricanes, tsunamis, and tornadoes. The study, which focused on the age of schools,

[20] Department of Defense, *Professional Guide Series: Incorporation of Shelter Eberle M. Smith Associates* (Washington, DC: Department of Defense, 1962), 2–4.

surveyed the condition of 903 public schools in the United States. It found that "older schools are in more disrepair, lack the necessary infrastructure for advanced telecommunications systems, have inefficient mechanical systems, and may lack safety features."[21] According to the study, the average age of schools was 42 years. The study did not address schools as functioning community sheltering facilities and the building maintenance for that purpose.

Technical capabilities during a disaster are important to ensure communication and efficiency. The National Renewable Energy Laboratory (NREL) cited the Department of Energy in 2003 as stating, "Under an extreme national disaster scenario, schools could provide a safe haven for up to 25 to 50 million citizens, or about 9%–18% of the U.S. resident population."[22] NREL makes the case that schools should be energy independent as storm shelters. By making school facilities self-reliant, NREL argues that it has "great value to the community during difficult times." In a time when many people depend on technology to communicate, an argument can be made on maintaining or building facilities with that in mind.

Solar advocates make a case for the necessity of energy security as part of emergency preparedness. This topic was the center of discussion at a 2005 symposium in Los Angeles where professionals from the solar and technology fields gathered to discuss "how our schools could become the center of emergency preparedness in response to a major earthquake disaster."[23] The Clean Energy Group 2005 report on Energy Security and Emergency Preparedness recommendations for federal action include requiring critical facilities to use clean energy technologies, and develop federal-state partnerships

[21] National Center for Education Statistics, *Condition of America's Public School Facilities: 1999* (NCES 2000–032) (Washington, DC: U.S. Department of Education Sciences, 2000), 18, http://nces.ed.gov/pubs2000/2000032.pdf.

[22] The National Renewable Energy Laboratory, *Using Schools as Community Emergency Centers* (Golden, CO: The National Renewable Energy Laboratory, 2003), http://www.alternativeenergydiscounthouse.com/t/News%20Events/UsingSchoolsasCenters.pdf.

[23] "Schools Solar Initiative," accessed October 29, 2016, http://www.tombradleylegacy.org/solar-schools-initiative-2005.html.

to "fund installations and facilitate joint procurement."[24] Similar recommendations for the state and local level were also listed; however, action on these recommendations has not occurred nationwide.[25] The recommendations aim to strengthen emergency preparedness and create an energy sufficient environment.

2. Safety and Security

In 2006, Professor Norio Okada of the Kyoto University's Disaster Prevention Research Institute proposed a framework for integrated risk management called the Vitae System Model.[26] This model suggests a holistic view of cities, regions, and communities through three fundamental functions: survivability, vitality, and conviviality and communication.[27] Important elements to achieve these system functions would need to include location, maintenance, and management of shelters.

In addressing the location of shelters, Weix Xu et al. from Kyoto University's Department of Urban Management offer a systemic approach to the concepts and types of disaster shelters as described by the Vitae System.[28] Xu et al. take the viewpoint that "shelter planning should appropriately link up post-disaster process to pre-disaster processes, so … some special methodological approach … can systematically combine retroactive event and proactive event."[29] Xu et al. outline categories of disaster shelters as wide-area, temporary, accommodation, and accommodation shelters for people who need support in the disaster. Xu et al. further state, "The safety of a shelter is the first and most

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[24] Clean Energy Group, *Energy Security & Emergency Preparedness: How Clean Energy Can Deliver More Reliable Power for Critical Infrastructure and Emergency Response Missions* (Montpelier, VT: Clean Energy Group, 2005), 10, http://www.cleanegroup.org/wp-content/uploads/Energy-Security-and-Emergency-Preparedness.pdf.

[25] Clean Energy Group, *Energy Security & Emergency Preparedness: How Clean Energy Can Deliver More Reliable Power for Critical Infrastructure and Emergency Response Missions*.

[26] Norio Okada, *City and Region Viewed as Vitae System for Integrated Disaster Risk Management* (Gokasho, Uji, Kyoto: Disaster Prevention Research Institute Kyoto University, 2006), http://www.dpri.kyoto-u.ac.jp/nenpo/no49/49b0/a49b0p12.pdf.

[27] Ibid.

[28] Wei Xu et al., "Conceptual Model of Shelter Planning Based on the Vitae System," *Annuals of Disas. Prev. Res. Inst., Kyoto Univ., No. 49 B*, 2006.

[29] Ibid., 3.

important component of the shelter planning."[30] Setting safety measure expectations is key.

Xu et al. also make a comparison of the types of shelters identified in Japan, the United States, and China. They compare these countries' disaster shelter criteria, which show Japan and the United States recognize the importance of safe location areas. However, Japan prioritizes safe evacuation routes and "lifeline support" and management of the shelter by community people. The U.S. guidance does not prioritize management among the top criteria for emergency shelters.[31] The authors explain that the United States categorizes shelters only as emergency and temporary shelters. An emergency shelter is a place for "potential disaster victims to stay for a short period." Defining the type of shelters that exist is important in the planning process. A temporary shelter provides shelter for a longer period of time for those who are displaced due to loss of property. The fundamental functions of the Vitae System provide a best practice approach to shelter planning.

In addressing safety and security, the severity of an incoming storm can be unpredictable. Although this thesis does not focus on disaster risk reduction (DRR), literature supports its link to climate change. The United Nations Office for Disaster Risk Reduction (UNISDR) addresses the overlapping challenges of disaster risk, sustainable development, and climate change. The UNISDR has published four briefing documents over the span of three years on climate change and disaster risk reduction to "enhance knowledge and understanding of comprehensive risk management approaches."[32] Supporting this theory are risk management consultants Bob Alexander and Jessica Mercer, who address climate change mitigation in an essay about process framework in decision making. The paper addresses the development of integrated community-based risk reduction processes for risk reduction in communities.[33]

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[30] Wei Xu et al., "Conceptual Model of Shelter Planning Based on the Vitae System," 4.

[31] Ibid.

[32] "Climate Change Adaption," July 24, 2016, https://www.unisdr.org/we/advocate/climate-change.

[33] Bob Alexander and Jessica Mercer, "Eight Components of Community Based Risk Reduction: A Risk Identification Application in the Maldives," *Research Publishing* 4, no. 1 (2012): 1.

One of the challenges in sheltering people from all walks of life is the possibility of integrating registered sex offenders under the same roof with women and children. Arlikatti, Kendra, and Clark raise concern over tracking and sheltering registered sex offenders following Hurricane Katrina in 2005.[34] The paper highlights a mitigation effort that took place in Texas where the Office of the Attorney General (OAG) launched a program called Operation Safe Shelter. According to a September 17, 2008 press release, the program is an emergency service that provides information about registered sex-offenders to shelter personnel. The press release states, "After confirming that subjects appeared on the sex offender registry, OAG personnel informed shelter supervisors and local law enforcement officials about the confirmation, thereby enabling authorities to closely monitor the subjects or otherwise respond appropriately."[35]

Texas has prepared a system for mass evacuations that includes the tracking of registered sexual offenders during transit, "to keep sex offenders and others who may be wanted by police off the same buses used by the most vulnerable during an evacuation."[36] In the event of an emergency evacuation, evacuees are registered and tracked through use of radio frequency identification (RFID) technology. An issued RFID wristband is scanned with a wireless device as a person boards a state vehicle, where the information is then added to the bus-boarding log. The evacuee's information is transmitted wirelessly to The University of Texas Center for Space Research data center.[37] More research is necessary to learn details about the use and effectiveness of this tracking system.

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[34] Sudha Arlikatti, James Kendra, and Nita A. Clark, "Challenges for Multi-Sector Organizations in Tracking and Sheltering Registered Sex Offenders in Disasters," *Journal of Homeland Security and Emergency Management* 9, no. 1, art. 27 (2012): 1547–7355, doi: 10.1515/1547-7355.1842.

[35] "Status Update: Operation Safe Shelter," September 17, 2008, https://www.texasattorneygeneral.gov/oagnews/release.php?id=2644.

[36] Terri Langford, "Next Texas Evacuees Will Face Criminal Checks," *Houston Chronicle*, December 15, 2007, http://www.chron.com/news/houston-texas/article/Next-Texas-evacuees-will-face-criminal-checks-1823231.php.

[37] Corey McKenna, "Sheltering a Sex Offender in Texas? Check the Database," Digital Communities, September 12, 2008, http://www.digitalcommunities.com/articles/Sheltering-a-Sex-Offender-in-Texas.html.

A non-profit organization in Japan has raised the issue of security in mass evacuation shelters. *Japan Today* published an article that stated, "According to project representatives, numerous cases of rapes, sexual assaults and groping that targeted women and children, were reported after the Great Hanshin Earthquake in 1995."[38] The concern over sexual assaults in evacuation centers was also raised following the 7.0 magnitude earthquake that struck Kumamoto on April 16, 2016.[39]

3. The Role of Government

Researcher John Twigg at the University College of London addresses the process of risk management and the critical role of government. He states, "The challenge of incorporating risk reduction into an organisation goes far beyond formal documents and project planning. Policies and practices must be understood, implemented and maintained. Organisations should assess their own capacity to understand and address the disaster problem. Review procedures should be set in place."[40] Twigg supports the claim that government must do more in making disaster preparation a priority.

In 2009, FEMA and the Hawaii Civil Defense Division produced two documents to delineate roles and responsibilities for a catastrophic hurricane. These documents are an example of federal and state collaboration in planning for a severe storm and the research examines whether schools as critical infrastructure is given attention. Additionally, Florida, Texas, and Japan have ample resources to examine how the roles of government in prioritizing emergency preparation.

Sufficient literature is available that highlights the significance of systemic approaches in preparing for weather-related disasters. Studies on climate change provide a case for states to prepare for more frequent storms and the importance of sheltering facilities, such as schools. In 2006, the Government Accountability Office released

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[38] McKenna, "Sheltering a Sex Offender in Texas? Check the Database."

[39] Tomoko Otake, "Sex Assault Likely at Evacuation Centers, Groups Warn," *The Japan Times*, May 6, 2016, http://www.japantimes.co.jp/news/2016/05/06/national/sex-assault-likely-at-evacuation-centers-groups-warn/#.WHQNBPPATAo.

[40] John Twigg, "Disaster Risk Reduction," *Good Practice Review 9, Overseas Development Institute*, no. 9 (March 2004): ch. 1, 26.

findings on the federal climate change funding, which mainly fall under the Environmental Protection Agency and the Department of Energy. The report had recommended that the agencies develop policy requirements.[41] The respective environmental and natural resources committees have held hearings over the years. The 2008 U.S. Senate Committee on Energy and Natural Resources held a hearing on climate change in coastal regions. The Chairman stated, "It's expected that within the next 50 years, we will see accelerated sea-level rise, increased storm intensity, and significant coastal erosion. The consequences of these events should not be underestimated."[42] There are a number of non-governmental and governmental documents that provide context to the action by states regarding climate change.

In 2013, President Obama signed an executive order directing federal agencies to take steps for communities to strengthen their resilience to extreme weather and prepare for other impacts of climate change. The order states:

> Managing these risks requires deliberate preparation, close cooperation, and coordinated planning by the Federal Government, as well as by stakeholders, to facilitate Federal, State, local, tribal, private-sector, and nonprofit-sector efforts to improve climate preparedness and resilience; help safeguard our economy, infrastructure, environment, and natural resources; and provide for the continuity of executive department and agency operations, services, and programs.[43]

The extent of comprehensive implementation of this executive order at the state and local levels is unknown. However, in 2014, the Hawaii Climate Adaption Initiative Act became law and called for the establishment of an Interagency Climate Adaptation

[41] John B. Stephenson, *Climate Change: Federal Agencies Should Do More to Make Funding Reports Clearer and Encourage Progress on Two Voluntary Programs* (GAO-06-1126T) (Washington, DC: U.S. Government Accountability Office, 2006), https://www.gpo.gov/fdsys/pkg/GAOREPORTS-GAO-06-1126T/pdf/GAOREPORTS-GAO-06-1126T.pdf.

[42] *Committee on Energy and Natural Resources*.

[43] Exec. Order No. 13653, Preparing the United States for the Impacts of Climate Change, Office of the Press Secretary, The White House (November 1, 2013).

Committee (ICAC).[44] The ICAC's first task was developing a statewide Sea Level Rise Vulnerability Assessment and Adaption Report, with a deadline of December 31, 2017.[45]

Other literature shows that Hawaii's building infrastructure is not up to current building standards that have been released in anticipation of stronger storms. The Report of Recommended Statewide Public Hurricane Shelter Criteria was developed in response to the Disaster Emergency Preparedness Act of 2005.[46] Information from this report notes Hawaii's severe public shelter shortage.[47] Hawaii schools are mentioned in the report as public emergency shelters that meet only the minimum building standards.[48]

4. Summary

The compiled literature reveals the need for further study and research into schools as public shelters. Ongoing examination into this problem space will bring needed attention to states faced with the challenge of aging school facilities and constrained budgets. Highlighting the practices of areas frequented by turbulent weather, such as Florida, Texas, and Japan, brings forward the issues and gaps that exist in Hawaii.

D. RESEARCH DESIGN

In answering the research questions, the research design comprises three steps: (1) identifying requirements and challenges, (2) analyzing solutions from three case studies, and (3) synthesizing and applying the cases studies to Hawaii and then assessing through policy recommendations. The analysis uses information from subject matter sources in emergency preparation and sheltering including government reports, news articles, studies, and other pertinent literature. States and countries with the incentive to dedicate

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[44] "Adapting to Climate Change," accessed December 12, 2016, http://planning.hawaii.gov/czm/initiatives/adapting-to-climate-change-2/.

[45] "Pili Na Mea A Pau: All Things Are Related," accessed December 12, 2016, http://climateadaptation.hawaii.gov.

[46] Ibid.

[47] State Civil Defense, *Report of Recommended Statewide Public Hurricane Shelter Criteria Hurricane Shelter Criteria Committee, State Civil Defense* (Honolulu, HI: State Civil Defense, 2005), http://www.seaoh.org/wp-content/uploads/2014/10/RecommendRpt-HurricaneShelterCriteria2005.pdf.

[48] Ibid., 12.

public resources to ensure emergency preparation measures are those that have experienced severe weather trends. Therefore, case examinations include Florida, Texas, and Japan.

Florida, where hurricanes are frequent, has allocated state investments, combined with funding from FEMA, to improve or build new storm shelters. The state sets exemplary policies supported by an executive commitment toward funding resources and management required for hardening schools for sheltering. A model practice can be derived from a better understanding of how Florida agencies work together in their emergency preparation efforts.

The safety and security of an activated shelter is a critical component to safeguarding evacuees. Texas offers an approach to sheltering registered sex offenders in disasters. While it is one safety-related area for analysis, consideration is given to solutions for preventing violence and combatting the spread of communicable diseases. At least one city in Texas has adopted the latest IBC standards; however, the literature shows that financial concerns prevent expansion in other districts.

Japan has similar island topography to Hawaii and has suffered extreme weather events including tsunamis and typhoons. With those experiences come many lessons learned, which include evacuation and sheltering preparation. Literature suggests that Japan has made immediate adjustments to its system following each natural disaster. Examining Japan's inclusive approach to management and large-scale volunteerism would be beneficial in determining policy options for Hawaii and other coastal states.

While varying areas of deficiencies can be found in Hawaii, this thesis does not identify all the challenges that exist in using schools as public shelters. The scope of this thesis analyzes the use of schools as public shelters as it pertains to safety and security, as well as resource management. Three main areas of concern emerged from the literature review: schools as shelters, safety and security, and the role of government.

This thesis explores how issues relevant to the areas within the research scope are connected. This thesis highlights solutions and concludes with an analysis of the

applicability of these issues to Hawaii and other coastal states. It presents a case that attention to schools as shelters is important in keeping communities safe.

E. CHAPTER OUTLINE

This chapter brought the issue of schools as shelters to attention and summarized literature used as resources towards shaping the framework of this thesis. The following chapters examine the possible deficiencies that exist in the practice of having schools serve as community evacuation centers or emergency shelters, and highlights solutions to those challenges. The next chapter provides a synthesis of current practices in Hawaii. Subsequent chapters highlight the practices in Florida, Texas, and Japan. The research focuses on three key areas discussed in the literature review: (a) schools as shelters, (b) safety and security, and (c) the role of government. Concluding chapters analyze what practices can be applicable to Hawaii, and based on the analysis, then formulate policy recommendations for consideration.

II. NEED FOR PREPARATION: HAWAII

The 50th state, Hawaii, is home to nearly 1.4 million residents, with more than 953,200 on the capitol island of Oahu.[49] Nicknamed the Gathering Place, Oahu gathers more people every year.[50] The U.S. Census Bureau reports the annual population increase on Oahu alone is projected to be 0.4 percent.[51] FEMA Region IX has recognized Hawaii's unique geography and the weather events that can take place. Emergency management officials reported, "The State of Hawaii's topography causes orographic speed-up resulting in intensification of wind speed across ridges and through valleys. As winds funnel between urban buildings and structures, they have the potential to amplify effects."[52] It is no surprise then that in 2009 FEMA Region IX and local emergency management officials developed a response plan in the event a Category 4 hurricane struck Oahu. The focus of the plan is long-term recovery.[53]

All the Hawaiian Islands have a challenge of better preparing residents and visitors for the possibility of a catastrophic storm, which would lessen the devastating effects that speed the recovery. This chapter examines the hurricane risks Hawaii faces. It provides an overview of Hawaii's efforts for public sheltering in the event of a storm and analyzes the use of school buildings.

A. OVERVIEW

It has been over two decades since Hawaii has experienced a severe hurricane that resulted in thousands of residents seeking shelter outside of their homes. The Central

[49] "Hawaii Population," accessed January 16, 2017, http://worldpopulationreview.com/states/hawaii-population/.

[50] "Oahu: The Gathering Place," accessed January 26, 2017, http://beyondhonolulu.com/oahu-the-gathering-place/.

[51] Department of Business, Economic Development and Tourism, *Population and Economic Projections for the State of Hawaii to 2040* (Honolulu, HI: Department of Business, Economic Development and Tourism, 2012), http://files.hawaii.gov/dbedt/economic/data_reports/2040-long-range-forecast/2040-long-range-forecast.pdf.

[52] FEMA, *Hawaii Catastrophic Hurricane Operations Plan (OPLAN)*, ver. 2. (Washington, DC: U.S. Department of Homeland Security, 2009), 10, https://www.honolulu.gov/rep/site/dem/dem_docs/plans/OPLAN_200900716.pdf.

[53] Ibid., 9.

Pacific Hurricane season runs from June 1 to November 30.[54] An average of five tropical cyclones occurs annually in the Central Pacific.[55] Typically, storm systems that have approached Hawaii from the east since 1950 eventually weaken to tropical storms or depressions.[56] While it is rare for the eye of a hurricane to hit the Hawaiian Islands directly, it has happened. The National Oceanic and Atmospheric Administration (NOAA)'s Central Pacific Hurricane Center references five "notable Hawaiian hurricanes;" among them is Hurricane Iniki, the strongest and costliest hurricane to strike Hawaii. The eye of this Category 4 hurricane ripped across the island of Kauai on September 11, 1992, leaving $1.3 billion of damage.[57] A post-storm report noted that thousands of homes were leveled and 12,000 residents were accommodated in public shelters during and after Iniki. Neighboring Oahu was also affected by the storm, but damage was much less severe. The number of evacuees who sought refuge in public shelters on Oahu was 30,000.[58] A 1993 report that provided lessons learned from Iniki noted not only the lack of public shelters available at the time of the storm but also the lack of trained shelter managers.[59]

Having protocols in place for warning systems and evacuations is part of the many aspects of emergency preparation efforts. However, emergency plans for Hawaii focus in large part on the recovery from a catastrophic event. In 2009, FEMA issued a hurricane operations plan (OPLAN) for Hawaii that outlined federal and state responsibilities and roles. The plan was created with the consideration of a Category 4 hurricane striking the island of Oahu. The plan reads as follows, "Approximately 650,000 people are expected to be displaced from their homes after a catastrophic hurricane on Oahu. The vast majority of residential structures within the State are unable to withstand

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54 "Central Pacific Hurricane Center," last modified October 15, 2016, http://www.prh.noaa.gov/cphc/.

55 "Summaries," last updated April 12, 2012, http://www.prh.noaa.gov/cphc/summaries/.

56 Jon Erdman, "A Tropical Storm Threat for Hawaii?" *The Weather Channel*, July 7, 2015.

57 "Central Pacific Hurricane Center."

58 U.S. Corps of Engineers, *Hurricane Iniki Assessment: Review of Evacuation Studies Utilization and Information Dissemination* (Washington, DC: FEMA, 1993), 6, https://coast.noaa.gov/hes/docs/postStorm/h_iniki_assessment_review_hes_utilization_info_dissemination.pdf.

59 Ibid.

catastrophic hurricane winds."[60] The OPLAN provides a list of "hub and spoke" staging sites to support displaced populations on Oahu. It describes these sites as a staging area that "will support several subordinate shelters through food distributions, communications, [and] supplies."[61] The identified hub shelters listed in the plan are mainly public school sites; a mix of elementary and high schools.[62] School systems have the responsibility of ensuring that education facilities can meet the needs of the operating plan. This compliance adds more responsibility for those schools in ensuring education facilities meet the needs for the hub and spoke system.

Moreover, the OPLAN estimated 80,000 visitors would require sheltering. A safety plan from the Hawaii Tourism Authority (HTA) has acknowledged "there is yet no comprehensive destination-wide contingency plan for worst-case scenarios in which visitors may be stranded, lack accommodations, etc."[63] The HTA five-year 2016 strategic plan did not make recommendations for the tourism organization to establish an evacuation protocol, which would need to take into account the visitors who stay in alternative accommodations. When FEMA and local emergency officials updated the 2015 hurricane plan, it did not specify evacuation procedures for visitors but mentioned HTA must inform visitors of flight availability because of the possibility of cancellations and delays due to weather.[64]

Increasing trends of stronger storms have been cited by county emergency officials, who play a key role in evaluating what areas would be most threatened by a catastrophic storm. Honolulu County updated its tsunami zones in 2016 to reflect the increased hazards of larger ocean swells.[65] The expanded evacuation zones affect 20

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[60] FEMA, *Hawaii Catastrophic Hurricane Operations Plan (OPLAN)*, 12.

[61] Ibid., 14.

[62] Ibid., 19–20.

[63] Tourism & More, Inc., *Hawaii Tourism Authority Safety/Security Review and Strategic Plan* (Honolulu: Hawaii: Hawaii Tourism Authority, 2007), 17, http://www.hawaiitourismauthority.org/default/assets/File/HTA15001-Strategic%20Plan_web.pdf.

[64] FEMA, *2015 Hawaii Catastrophic Hurricane Plan/FEMA RIX Hawaii Catastrophic Annex* (Washington, DC: U.S. Department of Homeland Security, 2016), 3–2, http://dod.hawaii.gov/hiema/files/2016/03/2015Hawaii_Cat_Plan.pdf.

[65] "Text Description of the Tsunami Evacuation Maps," last updated September 16, 2016, https://www.honolulu.gov/cms-dem-menu/site-dem-sitearticles/1295-des-tsunami-map.html.

public and private schools.[66] It is imperative for schools located in these zones to perform frequent drills to improve readiness by staff, students, and their families.[67] In the last decade, ongoing development within these evacuation zones has resulted in placing increased populations at risk. In noting the increase in residential and commercial real estate on the Honolulu coasts, reporter Chris Kirkham states, "Between Waikiki and downtown Honolulu, one of the last available parcels for coastal redevelopment in urban Oahu is undergoing a transformation."[68] The transformation of more residential buildings does not include the highest building standards for shelter safety. In 2014, Civil Beat reporter Sophie Cocke wrote, "More than two-thirds of the island's approximately 950,000 residents would be displaced, as the vast majority of residential structures aren't built to withstand Category 4 winds."[69] Based on that estimation of displaced people, more attention to shelter inventory is needed. A 1993 report that provided lessons learned from Iniki noted not only the lack of public shelters available at the time of the storm but also the lack of trained shelter managers.[70]

B. SCHOOLS AS SHELTERS

Hawaii looked to Florida as an example of laws established to ensure ample shelter space and its use of school facilities designed to include enhanced hurricane protection areas (EHPA).[71] Hawaii's 2005 Hurricane Shelter Criteria Committee issued recommendations based on Florida criteria and also requested more support for

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[66] Lisa Kubota, "New Oahu Maps Show More Areas at Risk," *Hawaii News Now*, accessed January 15, 2017, http://www.hawaiinewsnow.com/story/13058718/new-oahu-tsunami-maps-show-more-areas-at-risk

[67] "Emergencies," accessed January 28, 2017, http://www.hawaiipublicschools.org/BeyondTheClassroom/SafeSchools/Emergencies/Pages/home.aspx.

[68] Chris Kirkham, "Paradise, Hawaiian Style in Oahu Development; Howard Hughes Corp.'s 60-Acre Project Is One of Honolulu's Biggest Urban Expansions since the 1990s," *Wall Street Journal*, May 24, 2016.

[69] Sophie Cocke, "Hawaii Lacks Hurricane Emergency Plan for Waikiki, Neighbor Islands," *Civil Beat*, August 7, 2014, http://www.civilbeat.org/2014/08/hawaii-lacks-hurricane-emergency-plan-for-waikiki-neighbor-islands/.

[70] U.S. Corps of Engineers, *Hurricane Iniki Assessment: Review of Evacuation Studies Utilization and Information Dissemination*, 6.

[71] State Civil Defense, *Report of Recommended Statewide Public Hurricane Shelter Criteria Hurricane Shelter Criteria Committee, State Civil Defense*, 18.

implementation in the state's building design and construction.[72] This committee accounted a shelter capacity shortfall of at least 175,000 persons.[73] Furthermore, the schools identified as public emergency shelters met only the minimum recommended standards.[74] The committee stated:

> The Florida Legislature enacted a law establishing comprehensive measures to reduce a large statewide deficit of shelter space. These measures included a hurricane shelter survey and retrofit program and new requirements for the design and construction of school facilities to include Enhanced Hurricane Protection Areas. There were related efforts to reduce shelter demand by significantly upgrading building and residential code standards as well as public education.[75]

Hawaii has received recommendations to adopt similar policies. Hawaii enacted disaster emergency preparedness legislation in 2005 that identified the state's department of defense as the coordinating agency for repairing and maintaining retrofitted buildings.[76] However, no follow up report has been released to the legislature providing an assessment of facilities or schools that serve as public shelters.

Unlike other states where schools have an enclosed design, the majority of Hawaii schools are open-concept with multiple buildings and classrooms spread across a campus. The average age of Hawaii's public schools is 65 years.[77] Former state emergency management official Ed Teixeira stated in 2016, "I am looking at a decade of work in just the shelters alone—and it could be more than that. Every new school we build and every public building we put up, we gotta ask ourselves: Can that serve as a shelter for us?" That question may not at all be on the minds of education officials. The most recent public school built by the state achieved the goal of creating new learning environments

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[72] State Civil Defense, *Report of Recommended Statewide Public Hurricane Shelter Criteria Hurricane Shelter Criteria Committee, State Civil Defense*, 18.

[73] State Civil Defense, *Report of Recommended Statewide Public Hurricane Shelter Criteria Hurricane Shelter Criteria Committee, State Civil Defense*.

[74] Ibid., 12.

[75] Ibid., 14.

[76] Disaster Emergency Preparedness Act of 2005, State of Hawaii, section 6.

[77] "School Facilities," accessed January 17, 2017, http://www.hawaiipublicschools.org/ConnectWithUs/Organization/SchoolFacilities/Pages/home.aspx.

and incorporating energy efficiency designs.[78] The strategy behind its designs did not include the dual purpose of its use as a public shelter. It is unknown whether this school will be considered as a hurricane evacuation shelter should the need arise; however, the reason for the new school was due to new development in the area and growing needs of that community. A majority of hurricane shelters in Hawaii are public schools.[79]

C. SAFETY AND SECURITY

Should a tsunami strike, Hawaii school communities located in tsunami evacuation zones have less than 30 minutes to get to higher ground, which is why schools conduct evacuation drills.[80] The HIDOE does not specify when and the frequency with which schools should perform these drills. Instead, schools have the autonomy to incorporate measures into their own safety plans.[81] Occasionally, emergency officials will use a school to help publicize emergency preparedness. For example, in April 2015, to help the HIEMA kick off Tsunami Awareness Month, the HIDOE teamed up with the agency and held a tsunami evacuation drill at a school located in an evacuation zone.[82] Sirens were activated at a designated time and students filed calmly outside of class to a marked area. School administrators determine when to have the school perform emergency drills.

The state emergency agency promotes the need for preparation through annual preparedness events, and some agencies, like the HIDOE and utility companies, will also share information about the importance of having an emergency plan. The HIEMA also leads an annual statewide hurricane preparedness event called Makani Pahili, which

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[78] "Leaders Get First Look at the State's Newest Elementary School," July 21, 2015, http://www.hawaiipublicschools.org/ConnectWithUs/MediaRoom/PressReleases/Pages/hookele.aspx.

[79] "Map of Hurricane Shelters in Hawaii," accessed January 17, 2017, https://portal.ehawaii.gov/page/data-map/?dataset=hurricane-shelters.

[80] "Tsunami-zone Schools," accessed January 18, 2017, http://www.hawaiipublicschools.org/BeyondTheClassroom/SafeSchools/Emergencies/Pages/home.aspx.

[81] Office of School Facilities & Support Services Safety, Security, & Emergency Preparedness Branch, *Emergency Procedures Guide* (Honolulu, HI: Department of Education, State of Hawaii, 2009), http://www.hawaiipublicschools.org/DOE%20Forms/Emergency%20Procedures%20Guide.pdf.

[82] "Jefferson Elementary Kicks off Tsunami Awareness Month with Evacuation Drill," April 1, 2016, http://www.hawaiipublicschools.org/ConnectWithUs/MediaRoom/PressReleases/Pages/Jefferson-Drill.aspx.

coincides with the start of hurricane season.[83] The event is aimed at improving hurricane response and coordinating recovery management processes with federal, state, and local stakeholders.[84] Hawaii public schools do not hold hurricane preparedness drills; rather, those seeking information regarding hurricane preparedness of public schools are directed to the HIEMA.[85] School administrators are responsible for reviewing the safety plan of schools and sharing any concerns with the HIDOE's Safety, Security, & Emergency Preparedness Branch.[86] When a major tropical storm or hurricane is approaching the state, school closures go into effect, and county officials then determine what schools will be activated as public shelters.[87] When that occurs, the Hawaii chapter of the American Red Cross becomes the lead agency at the school shelters.

An agreement to establish procedures between the HIDOE and the American Red Cross, Hawaii State Chapter (hereafter Red Cross) for the use of schools during times of disasters dates back to 1998.[88] The procedures acknowledge existing federal and state laws that require employees to assist during a disaster including the Disaster Relief Act of 1974 and Hawaii Revised Statutes, Section 127.9.[89] These provisions indicate that school personnel at schools activated as shelters must, "provide support services and necessary equipment and supplies."[90] It goes on to list the required staff to assist with shelter operations, which include a cafeteria manager, a custodian, and two additional staff.[91] However, the HIDOE's procedures for shelter opening were updated in 2014; absent the

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[83] "Hawaii National Guard Hosts Its Largest Ever Disaster-Preparedness Exercise," June 1, 2015, http://dod.hawaii.gov/blog/slider/hawaii-national-guard-hosts-its-largest-ever-disaster-preparedness-exercise/.

[84] Ibid.

[85] "Emergencies, School Closures," accessed January 18, 2017, http://www.hawaiipublicschools.org/BeyondTheClassroom/SafeSchools/Emergencies/Pages/home.aspx.

[86] Ibid.

[87] Ibid.

[88] State of Hawaii, *Procedures for Implementing Disaster Services Between The American Red Cross, Hawaii State Chapter and Department of Education*, Rev. 1/98 (Honolulu: HI State of Hawaii, 1998).

[89] Ibid.

[90] State of Hawaii, *Section III, Procedures for Implementing Disaster Services Between The American Red Cross, Hawaii State Chapter and Department of Education* (Honolulu: HI: State of Hawaii, 1998).

[91] Ibid.

list of required staff needed for assisting the Red Cross. The 2014 shelter opening procedures for schools do include the conducting of a formal walk through by the principal and Red Cross personnel, and that once determined satisfactory, "the principal will formally turn over the facility to the Red Cross personnel."[92]

Limited information is available regarding safety and security procedures for hurricanes other than the school closure itself, which is determined by the county's civil defense agencies. The planning for response exercises by emergency management and the Department of Defense are beneficial for agency collaboration during and in the aftermath of a severe storm; however, more formal training with the HIDOE is needed to ensure that schools are prepared in their role as evacuation sites.

D. ROLE OF GOVERNMENT

The Hawaii Legislature raised the concern over the lack of public shelters in 2005, and since then, not much attention has been given to issue. In response to the state's Disaster Emergency Preparedness Act of 2005, the Hurricane Shelter Criteria Committee was formed to report and recommend criteria for facilities to be capable of withstanding a major hurricane event.[93] The committee's report to the Hawaii Legislature points to the "severe shortage" of public shelters even if "only 35% of the resident populations seeks protection in public shelters."[94] Years after the filing of that report, *KITV* news reporter Andrew Perreira stated, "Not much has changed in the past nine years."[95] With school facilities at the forefront of providing sheltering for Hawaii residents, attention to the state of school facilities is needed.

Currently, Hawaii's building code calls for construction that can withstand a Category 3 hurricane, not a Category 4 hurricane.[96] As previously mentioned, Hurricane

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[92] Hawaii State Department of Education, *Shelter Opening Procedures for School* (Honolulu, HI: Hawaii State Department of Education, 2014).

[93] State Civil Defense, *Report of Recommended Statewide Public Hurricane Shelter Criteria Hurricane Shelter Criteria Committee, State Civil Defense*, 1.

[94] Ibid.

[95] Andrew Pereira, "Hawaii Has Severe Shortage of Storm Shelters," KITV, October 14, 2014.

[96] Fujii, "Storm Warning."

Iniki was a Category 4 hurricane. Hawaii has not yet experienced another catastrophic weather occurrence at that intensity. However, the concern over the need for hardened public shelters remains.

In Hawaii, the Department of Education and the Department of Accounting and General Services oversee the building and maintenance of public schools.[97] The 2005 committee report notes that no statewide hurricane-resistant criteria for public buildings are in place and that each county adopts and assesses its own building standards. Therefore, no statewide HIDOE standard exists for building new facilities; it depends on the county in which the new facility is being built. Additionally, the committee stated the current inventory of existing and potential shelter facilities should be surveyed statewide and evaluated in accordance with the updated criteria and Benchmark Code Edition Year Guidelines. Many shelters are not meeting the level of safety assurance called for in the Act.[98] The legislature has not yet revisited the many committee recommendations leaving the potential for more education facilities to be built without consideration of including budgeting for the design and construction for buildings to meet EHPA requirements and surveying potential facilities in accordance with updated building criteria. Otherwise, the potential exists for more education facilities being built without consideration for their sheltering purpose.

Funding is imperative for any initiative to be implemented and emergency preparedness is no different. In 1993, the Hawaii State Legislature established the Hawaii Hurricane Relief Fund (HHRF) to provide hurricane insurance policies should they not become available in the private sector.[99] In 2002, the Fund ceased operations with $186.7 million in the HHRF.[100] Despite the 2005 hurricane committee's recommendation to invest in retrofitting schools and other buildings that serve as shelters, no effort was made

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[97] State Civil Defense, *Report of Recommended Statewide Public Hurricane Shelter Criteria Hurricane Shelter Criteria Committee, State Civil Defense*, 12.

[98] Ibid.

[99] "Hawaii Hurricane Relief Fund," accessed February 5, 2017, http://cca.hawaii.gov/ins/hawaii-hurricane-relief-fund/.

[100] "State Fiscal Reserves: Hurricane Relief Fund," accessed February 5, 2017, http://budget.hawaii.gov/budget/about-budget/state-fiscal-reserves/.

to utilize the remaining reserve funds for such purposes. In 2011, state lawmakers took $42 million from the HHRF to help balance the state's budget.[101] This money could have been allocated for assisting counties in meeting EHPA standards and training in shelter management for HIDOE.

E. CONCLUSION

Hawaii faces several challenges in maintaining schools as shelters ranging from appropriate building standards and retrofitting to emergency management training for school personnel and funding. However, recommended solutions are not lacking. For Hawaii, putting those recommendations into action will take leadership from the state's executive level. The next chapter highlights some of the shelter criteria practices of Florida.

[101] "Hawaii Governor Authorizes Raid of Hurricane Relief Fund," June 1, 2011, http://www.insurancejournal.com/news/west/2011/06/01/200730.htm.

III. LEGISLATING HURRICANE PREPAREDNESS: FLORIDA

Florida is the third most populous state in the nation with an estimated population of 20,612,439.[102] It is a known destination for retirees and immigrants from the Caribbean and Central America. The location's coastal region is not only prime real estate but also an area with a high risk of storm damage from ocean swells. Florida has experienced a number of powerful hurricanes resulting in a heightened awareness by its residents of the dangers and destruction from a catastrophic storm. According to the National Hurricane Center, it is the most vulnerable coastal state in the United States. Seven of the top 10 most costly hurricanes in U.S. history have taken place in the State of Florida.[103] A total of nearly 240 tropical cyclone or subtropical cyclones have impacted Florida since 1950.[104] Its likelihood of being struck by severe weather has resulted in Florida laws aimed at mitigation efforts for homeowners and public facilities to harden property in hopes of decreasing potential loss of life and property.[105] This chapter reviews Florida's practices for emergency preparation and the use of schools as shelters. It synthesizes the attention given to schools as shelters.

A. OVERVIEW

The frequency of storms that approach or strike Florida keeps residents on guard and officials in constant communication when a storm is nearby. A recent example took place on the morning of October 6, 2016, when Hurricane Matthew, a Category 4 hurricane, was rapidly approaching the Florida coast after rolling over Haiti.[106] A

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[102] "Florida, American Fact Finder," accessed March 12, 2017, https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

[103] "Hurricanes," accessed November 14, 2016, http://www.iii.org/fact-statistic/hurricanes. Insurance Information Institute.

[104] *Wikipedia*, s.v. "List of Florida Hurricanes," last modified September 1, 2015, https://en.wikipedia.org/wiki/List_of_Florida_hurricanes.

[105] Florida Association of Insurance Agents, *A Brief History of Wind Mitigation* (Tallahassee, FL: Florida Association of Insurance Agents, n.d.), accessed October 7, 2016, http://www.faia.com/core/contentmanager/uploads/Education%20Department/PDFs/PMRC/Mitigation%20Document.pdf.

[106] Reuters, "Hurricane Matthew Death Toll Rises to over 800 in Haiti as Storm Strikes U.S.," *CNBC*, October 7, 2016, http://www.cnbc.com/2016/10/07/hurricane-matthew-death-toll-rises-to-over-800-in-haiti-as-storm-strikes-us.html.

Category 4 hurricane packs winds ranging from 131 to 155 miles per hour, enough to cause catastrophic damage to property and place lives in danger. The initial estimated death toll in Haiti surpassed 800.[107] In a span of 48 hours, a number of Florida counties were advised to evacuate residents from their homes. More than 1.5 million Floridians live in evacuation zones and the call for evacuations is not taken lightly.[108] Brevard County Emergency Operations is one example where a mandatory evacuation was issued for the barrier islands and other low-lying areas during Matthew's approach.[109] Governor Rick Scott stated, "We should not put peoples lives at risk because you made the foolish decision not to evacuate."[110] This statement was made during live news coverage of the approaching storm.

Within 48 hours of Matthew's approach, schools were closed and those not in evacuation zones were reopened as evacuation shelters.[111] For example, one news outlet reported that for Polk County, "the following schools will serve as shelters: Alta Vista Elementary School in Haines City, Ridge Community High School in Davenport and Spook Hill Elementary School in Lake Wales."[112] Over the years, Florida has progressively increased attention to education facilities as emergency shelters.

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[107] Ada Carr, "Haiti Death Toll Climbs above 800 in Hurricane Matthew's Wake," Weather.com, accessed October 7, 2016, https://weather.com/news/news/hurricane-matthew-haiti-latest-news-0.

[108] "Hurricane Matthew Approaches Florida; Governor Urges 1.5 Million to Flee," *New York Times*, October 6, 2016, http://www.nytimes.com/2016/10/06/us/hurricane-matthew-us.html

[109] Aileen Perilla, "Brevard County Begins Mandatory Evacuations at 3 p.m.," *Orlando Weekly*, accessed October 5, 2016, http://www.orlandoweekly.com/Blogs/archives/2016/10/05/brevard-county-begins-mandatory-evacuations-at-3-pm.

[110] "Gov. Scott on Hurricane Matthew: 'It's a Monster, Get Out,'" October 6, 2016, http://miami.cbslocal.com/2016/10/06/florida-governor-evacuate-evacuate-evacuate/.

[111] Florida TODAY Staff, "Brevard Public Evacuation Shelters Open," *Florida Today*, accessed November 7, 2016, http://www.floridatoday.com/story/weather/hurricanes/2016/10/05/public-evacuation-shelters-open-4-pm/91612820/.

[112] WFTV Staff, "The Latest on Central Florida School Closures," WFTV, accessed October 8, 2016, http://www.wftv.com/weather/tropical/the-latest-on-central-florida-school-closures-/453393503.

B. SCHOOLS AS SHELTERS

In 1994, Florida evaluated the use of its public hurricane shelters with the goal to retrofit or mitigate projects for emergency purposes.[113] The Florida Division of Emergency Management provided a statewide emergency shelter plan to identify the state's capacity to shelter residents in high evacuation areas. Pursuant to section 1013.372(2), and 252.385(2)(b), Florida Statutes, the shelter plan is prepared and submitted to the Governor and Cabinet for approval. This Statute was created following the destruction of Hurricane Andrew in August 1992, a Category 5 hurricane that stuck Florida with wind speeds of up to 165 miles per hour.[114] The shelter plan provides information on existing and long-term hurricane evacuation shelter space requirements. The information in the plan is used by school districts, colleges, and emergency management agencies for facility construction to ensure compliance with the Florida Building Code's Public Shelter Design Criteria.[115] In 2001, Florida initiated design requirements for facilities in the state's Department of Education. With the exception of those buildings in evacuation zones, the criteria described the physical requirements necessary for schools that become hurricane shelters.[116] The 2014 Statewide Emergency Shelter Plan noted, "public schools are the primary source of public shelter during tropical weather related emergencies, currently accounting for 97 percent of statewide hurricane evacuation shelter space."[117] Universities and community colleges account for two percent of Florida's shelter space.[118] The remaining one percent of hurricane evacuation shelter capacity is fulfilled by state and local public facilities.[119]

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[113] Division of Emergency Management, *2001 Shelter Retrofit Report* (Tallahassee, FL: Department of Community Affairs, 2001), 4, http://www.floridadisaster.org/Response/engineers/documents/2001Retr.pdf.

[114] *Wikipedia*, s.v. "Hurricane Andrew," last modified October 28, 2015, https://en.wikipedia.org/wiki/Hurricane_Andrew.

[115] "Hurricane Shelters and Critical Facilities Library," accessed November 14, 2016, http://www.floridadisaster.org/Response/engineers/library.htm.

[116] Division of Emergency Management, *2001 Shelter Retrofit Report*, 140.

[117] Division of Emergency Management, *2014 Statewide Emergency Shelter Plan* (Tallahassee, FL: Department of Community Affairs, 2001), 4–1, http://www.floridadisaster.org/Response/engineers/SESPlans/2014SESPlan/documents/0%20-%202014-SESP-Complete%20Document%20FINAL.pdf.

[118] Division of Emergency Management, *2014 Statewide Emergency Shelter Plan*, 2–12.

[119] Ibid., 4–3.

The Florida Division of Emergency Management is tasked with meeting the responsibilities defined by the standards. The division must incorporate a "multifaceted strategy that includes promoting the use of public selection criteria, in accordance with the American Red Cross Standards for Hurricane Selection, ARC 4496."[120] ARC 4496 is a set of hurricane evacuation shelter standards developed by an interagency group comprised of the FEMA, the U.S. Army Corps of Engineers, the Environmental Protection Agency and Clemson University.[121] The standards relay the importance of increasing shelter inventory and promote a building process for new public facilities, including schools, to make them more resilient to possible wind damage.[122] Florida determined the projected population and the need for shelter requirement.[123] Schools have played a major role in providing Florida's public shelter and were sought to assist with increasing the amount of shelters.

The Florida Department of Education issued a 2001 memorandum to all school district superintendents, community college presidents, and educational facilities planners regarding the role of educational facilities in curbing the shelter shortage in Florida. The memo states, "It is imperative that shelter space be provided in all appropriate new educational facilities so that the deficit in shelter space can be eliminated."[124] It goes on to recommend proactive collaboration with the county emergency management office in identifying appropriate shelter space.

In 2014, Florida's Division of Emergency Management Statewide Emergency Shelter Plan identified the inventory of special needs shelters (SpNSs) space and the need for more space through 2019. It identified the counties that have a surplus of hurricane evacuation shelter spaces per region, and those areas with a deficit. The Plan indicates

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120 "Hurricane Shelters and Critical Facilities Library."

121 American Red Cross, *Standards for Hurricane Evacuation Shelter Selection* (Tallahassee, FL: Florida Division of Emergency Management, 2002), http://www.floridadisaster.org/Response/engineers/documents/newarc4496.pdf.

122 Ibid.

123 Division of Emergency Management, *2014 Statewide Emergency Shelter Plan*, 3–1.

124 Division of Emergency Management, *2006 Statewide Emergency Shelter Plan* (Tallahassee, FL: Department of Community Affairs, 2006), Appendix I, http://www.floridadisaster.org/Response/engineers/documents/06SESP/2006-SESP-Final-WholeDocument-rev.pdf.

compliance criteria for public facilities in shelter design. Florida laws were updated in 2016 under its K-20 education code specifying education facilities as emergency shelters. The statute also indicates that construction of Department of Education facilities must be built to serve as an emergency shelter. To be compliant, the Plan noted, "the Department of Education was required to develop criteria, in consultation with district boards and state and local emergency management offices."[125] The additional requirements indicate the priority Florida places on school facility as public shelters.

C. SAFETY AND SECURITY

Activated shelters must have been deemed a safe haven before opening its doors to people of all walks of life. As mentioned earlier, Florida statutes require educational facilities to meet public shelter design criteria.[126] This includes having Enhanced Hurricane Protection Area (EHPA) emergency systems, which include, but are not limited to: an emergency lighting system, illuminated exit signs, fire protection system(s), campus wide alarm and sprinkler systems, and minimum ventilation for health or safety purposes.[127] The Florida health department also issues design criteria for SpNS selection that among the emergency management considerations include accessibility and sanitation requirements.[128] It also states the spacing requirements for occupants, both special needs and non-special needs.[129]

Safety and security aspects include establishing a safe environment in a confined space. While absent from Florida's 2016 Statewide Emergency Shelter Plan, law enforcement in shelters is mentioned in the Educational Facilities Disaster and Crisis Management Guidebook. The section titled, "Law Enforcement in Shelters," provides guidance to the shelter manager on discussing the logistical needs of an officer. "This

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[125] Division of Emergency Management, *2014 Statewide Emergency Shelter Plan*, 1–6.

[126] Florida Statues, Florida Building Code 555.73, Section 423.

[127] Ibid., Section 423.25.5.

[128] Florida Department of Health, *Standards for Hurricane Evacuation and Disaster Event Special Needs Shelter Selection* (Tallahassee, FL: Florida Department of Health, 2015), 1, http://www.floridadisaster.org/Response/engineers/SESPlans/2016SESPlan/documents/2016-SESP-AppxF2_DOH-SpNS%20Facility%20Standards_Final.pdf.

[129] Ibid.

may include separating the officer and registered sexual offender (and family, if applicable) from the general population, keeping them away from children, and having the law enforcement officer present with the registered sexual offender at all times."[130] The onus is on the shelter manager to first learn about the presence of a registered sexual offender then notifying law enforcement, as well as the County Emergency Operations Center.[131] The guidelines do not indicate how shelter management would identify the presence of a sex offender. It would take a registered offender to self-identify to shelter management before law enforcement can be notified. A background check of all those who enter an emergency shelter would assist in this security process.

D. ROLE OF GOVERNMENT

Florida's focus on schools as sheltering facilities and their management is evident in educational memos, emergency plans, and state laws. The state's legislature passed a number of policies focused on emergency management, planning, and prevention. These policies offer insight into the prioritization of schools as shelters. For example, Statute 252.385 requires the Division of Emergency Management to provide information on existing and long-term hurricane evacuation shelter space, which includes oversight over the ARC model shelter guidelines. The shelter selection guidelines date back to October 1997 and serve as a statewide manual. It covers design criteria of new facilities, surveying existing buildings, identifying shelter capacity, and the recommendation of retrofitting and mitigation projects to ensure proper shelter space.[132]

District school boards use the information to comply with Florida building code's public shelter design criteria.[133] Additionally, Florida state law requires its Division of Emergency Management to compel emergency management agencies to submit a

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[130] Florida Department of Education, *Educational Facilities Disaster & Crisis Management Guidebook* (Tallahassee, FL: Florida Department of Education, 2007), 138, http://www.scphoh.org/PDFS/PDF-Schools/edfacilities-disaster-management-guidebook-2007.pdf.

[131] Ibid.

[132] State of Florida, *Model HES Student Manual* (State of Florida: 1997).

[133] "The 2016 Florida Statutes," accessed July 26, 2016, http://www.leg.state.fl.us/statutes/index.cfm?mode=View%20Statutes&SubMenu=1&App_mode=Display_Statute&Search_String=252.385&URL=0200-0299/0252/Sections/0252.385.html.

statewide emergency shelter plan to the governor and the cabinet for approval of every even-numbered year.[134] This requirement is an important element in the ongoing planning and communication of and between government agencies for disaster and crisis management. Florida also provides a disaster preparedness guidebook for managers of school districts and community colleges.

1. Dedicated Resources

The attention to hurricane preparedness in Florida is set at the highest level of state government. Every year, the state holds the Governor's Hurricane Conference (GHC). The five-day conference provides training and workshops that highlight best practices for organizations to improve "disaster response/recovery processes."[135] However, the lack of resources to construct schools to serve a dual function as an emergency shelter is an issue. Currently, funding for the building of a school that serves the dual function for a community emergency is not a line item in the budget. In the 2014 Statewide Emergency Plan, "The Division recommends the use of existing capital outlay funds as they are appropriate and available source of state funding."[136]

Governor Rick Scott's 2016–2017 Policy and Budget Recommendations indicates $526 million would go towards educational infrastructure.[137] If any of these funds go towards the construction of new educational facilities, according to the existing state law, they would need to be built to function as an emergency shelter. The governor also indicates that $15 million would go to "quick response training." The implementing bill does not provide details on whether that training would include emergency shelter management for educators, nor does the bill specify emergency shelters.[138]

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134 FL Stat § 1013.372 (2016).

135 "Why Should You Attend the GHC," accessed October 10, 2016, http://flghc.org/why-attend-ghc.

136 Division of Emergency Management, *2014 Statewide Emergency Shelter Plan*, Executive Summary, iv.

137 Rick Scott, *Florida First: Governor Rick Scott's Florida First Budget 2016–2017* (Tallahassee, FL: Fighting for Florida's Future, 2017), 20, http://www.floridafirstbudget.com/content/current/reports/Budget-Presentation-FY-17.pdf.

138 Rick Scott, *Governor's Budget Recommendation—Implementing Bill* (Tallahassee, FL: Fighting for Florida's Future, n.d.), accessed October 8, 2016, http://www.floridafirstbudget.com/web%20forms/OtherInfo/reports/Governors-Recommended-Budget-Implementing-Legislation.pdf.

Nevertheless, the argument can be made that Florida's government has acted responsibly in light of lessons learned from the frequency of powerful hurricanes and by the creation of its Annual Governor's Hurricane Conference. The year 2017 marks the 31st Annual Governor's Hurricane Conference, which will offer dozens of training sessions and workshops for professionals involved in the hurricane preparedness response effort.[139] The constant attention to hurricane preparedness assessment allows for communication of the issue to remain at the forefront.

Distribution of information during a storm is critical to saving lives and securing property. As Hurricane Matthew continued its approach to Florida's coast in early October 2016, the Florida Division of Emergency Management and the governor's office provided detailed information about the status of sheltering efforts. To help residents and visitors locate a shelter in their area, information was given through the media and an evacuation website, FloridaEvacuates.com that was reflected on a "Florida-Evacuates app."[140]

2. Lessons Learned in the Role of Government

Severe hurricanes exposed a number of emergency planning flaws including residential and public facility construction, communication, and evacuation planning. In 1992, Hurricane Andrew hit South Florida with winds in excess of 155 miles per hour. The Category 5 reached wind strength of up to 177 miles per hour, destroying nearly 100,000 homes, and 25,000 in Miami-Dade county alone.[141] Following Andrew, a recommendation by the Governor's Disaster Planning and Response Review Committee identified the lack of addressing appropriate public shelter space resulted in laws that would establish "safe public hurricane evacuation shelter space in every region of the State."[142] However, management and communication are not outlined in those laws. If

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[139] "Why Should You Attend the GHC."

[140] "Gov. Scott Issues Updates on Hurricane Matthew Preparedness Efforts as Storm Approaches Florida," October 6, 2016, http://www.flgov.com/2016/10/06/gov-scott-issues-updates-on-hurricane-matthew-preparedness-efforts-as-storm-approaches-florida-4/.

[141] *Wikipedia*, s.v. "Hurricane Andrew."

[142] Division of Emergency Management, *2014 Statewide Emergency Shelter Plan*, 12.

residents leave their homes for safer areas, such as sheltering, the best way to get there, who directs them, and what happens when no direction is given other than to get to a safe area is not clear. Seven years later, in 1999, Hurricane Floyd was predicted to take a similar path and hit with similar intensity as Andrew. That September, as Floyd (a Category 4 hurricane) made its approach, more than a million Floridians fled their residences, marking the nation's largest evacuation in history.[143] A number of evacuation problems were exposed, presenting yet another opportunity for developing a better system, as well as alternative safety actions. An Evacuation Study Task Force was formed, and subsequently, a number of recommendations were made, one of which focused on various areas, such as agency collaboration and communication to the importance of accessible public shelters.[144]

Ensuring that emergency preparedness recommendations are being implemented is essential to pre-mitigation planning. A facilities and crisis guidebook issued by the Florida Department of Education and used by facility personnel specifies that its intended audience does not include school administrators rather it is for facility managers.[145] With principals being the leader of the school and its operations, not focus on that role is an oversight. The Guidebook provides of checklists for preparation and recovery of the storm, which allows for transitioning from the duration to the aftermath phases. The Guidebook comes equipped with forms, such as a "pre-storm work assignment form," used to assign staff to specific locations. The lead at a designated emergency shelter during the storm appears to fall under emergency management.

E. CONCLUSION

Florida has set a high bar for other states to follow in providing information for residents and visitors to prepare for a powerful hurricane. The state has invested over 30

[143] Rick Brag, "Hurricane Floyd: In Florida; For Most Floridians Relief that a Monster Storm Pulled its Punch," September 16, 1999, http://www.nytimes.com/1999/09/16/us/hurricane-floyd-florida-for-most-floridians-relief-that-monster-storm-pulled-its.html.

[144] Florida Division of Emergency Management, *Governor's Hurricane Task Force Report* (Tallahassee, FL: Florida Division of Emergency Management, 1999), 54–57, http://www.floridadisaster.org/documents/HurricaneTaskForceReport.pdf.

[145] Florida Department of Education, *Educational Facilities Disaster and Crisis Management Guidebook*.

years of conferencing about hurricane preparedness, whereby agencies are held accountable and issues have been mitigated. One of the most critical areas for schools is the criteria that exist to ensure that educational facilities can serve as public shelters in emergencies. Information on school closures is provided clearly and promptly; however, one area that still needs attention is the role of school officials during the storm. Such information is not indicated in the Guidelines or the state law.

An important aspect in Florida's hurricane preparedness efforts is its annual Governor's Hurricane Conference that discusses both the successes and mistakes made in dealing with hurricane-related challenges. This conference provides a seat at the table for agencies looking for improvements and keeping hurricane impacts at the forefront, regardless of a hurricane landfall. However, with many of Florida's educational facilities providing shelter during severe weather for its millions of coastal residents, the shelter manager role is still an area that must be specified for school officials who would presumably know their facilities best.

IV. SITUATIONAL AWARENESS: TEXAS

Among the U.S. cities most vulnerable to powerful hurricanes are the Florida cities of Miami and Tampa/St. Petersburg and the Texas cities of Houston and Galveston.[146] Located on the Gulf Coast of Texas, Galveston is an island city with a resident population of about 50,000.[147] The area is prone to severe weather conditions including hurricanes and tropical storms, which make public sheltering a top priority for emergency management. More than 27 million people reside in the Lone Star State.[148] Those who reside in the northern region are located within the tornado-prone districts, also known as Tornado Alley.[149] Many people reside in the coastal region where "population growth and economic development have placed more people and property at risk."[150] When the Atlantic hurricane season is in effect, the first to brace for the storms are residents along the state's Gulf Coast.[151] This chapter looks at various issues arising out of Texas's use of its schools as shelters and recognizes initiatives implemented by the state for the safety and security of evacuees.

A. OVERVIEW

Hurricane Ike struck Texas and made landfall in Galveston on September 13, 2008. In preparation for Ike, FEMA urged residents who were traveling inland to bring

[146] Andrew Freedman, "Top 5 Most Vulnerable Cities to Hurricanes," *Climate Central*, June 6, 2012, http://www.climatecentral.org/news/top-5-most-vulnerable-us-cities-to-hurricanes.

[147] "Galveston, Texas," accessed December 24, 2016, http://www.city-data.com/city/Galveston-Texas.html.

[148] "QuickFacts—Texas," accessed January 28, 2017, http://www.census.gov/quickfacts/table/PST045216/48.

[149] Kim Ann Zimmermann, "Tornado Alley: Where Twisters Form," Live Science, December 19, 2012, http://www.livescience.com/25675-tornado-alley.html.

[150] Richard W. Dixon and Todd W. Moore, "Tornado Vulnerability in Texas," *Weather, Climate, and Society* 4, no. 1 (2012): 59–68.

[151] John Boyd, "Here's Where Every Major Texas Hurricane or Tropical Storm Has Come from since 1990," *Houston Chronicle*, May 29, 2015, http://www.chron.com/news/houston-weather/hurricanes/article/Here-s-where-every-major-Texas-hurricane-or-6295050.php.

personal supplies to evacuation shelters, which included schools.[152] FEMA announced support for public shelters, noting, "Most evacuation shelters will be joint operations among cities, schools and the American Red Cross. More than 100 onsite FEMA community relations specialists —including speakers of Spanish, Korean, Laotian and Vietnamese—will support shelter operations by tracking needs and relaying information to state officials."[153] The Category 2 storm made a historic impact on Texas with its massive storm surge.[154] A storm surge is an abnormal rise of water during a storm, which for Texas occurs along the East and Gulf coastal areas.[155] During Ike, Galveston Bay and the neighboring Bolivar Peninsula saw storm surges that ranged from 10 to 20 feet.[156]

The damage left by Ike's storm surge is a reminder of the need for coastal areas to prepare for all the differing weather elements that come with a hurricane. A science writer for Climate Central, Andrew Freedman, states, "Typically, hurricanes will strike the Texas coast once every nine to 16 years, while tropical storms are more common than that. While Ike was a powerful Category 2 storm at landfall, it was a large storm, and it drove a storm surge onshore that was more typical of a Category 4 storm."[157] Storm and flooding damage from Ike was estimated at $21.3 billion, making it the third most costly hurricane in the country.[158] In Galveston, Ball High School and the shelter it provided helped to save 200 residents.[159] However, Galveston City suffered greatly with

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[152] "Residents Urged to Bring Personal Supplies to Evacuation Shelters," September 12, 2008, https://www.fema.gov/news-release/2008/09/12/residents-urged-bring-personal-supplies-evacuation-shelters.

[153] Ibid.

[154] Craig Hlavaty, "Hurricane Ike Hit the Houston and Galveston Areas Eight Years Ago this Week," *The Houston Chronicle*, September 13, 2016, http://www.chron.com/news/houston-texas/houston/article/Hurricane-Ike-hit-the-Houston-and-Galveston-areas-9219780.php.

[155] National Oceanic Atmospheric Administration, *Introduction to Storm Surge* (Washington, DC: U.S. Department of Commerce, n.d.), 1, accessed January 2, 2017, http://www.nws.noaa.gov/om/hurricane/resources/surge_intro.pdf.

[156] "Hurricanes in History," accessed December 21, 2016, http://www.nhc.noaa.gov/outreach/history/#ike.

[157] Freedman, "Top 5 Most Vulnerable Cities to Hurricanes."

[158] FEMA, *Mitigation Assessment Team Report: Hurricane Ike in Texas and Louisiana* (FEMA P-757) (Washington, DC: U.S. Department of Homeland Security, 2009), https://www.fema.gov/media-library-data/20130726-1648-20490-2912/757_toc_execsum_final.pdf.

[159] Oren Dorell, "Almost 2,000 Ike Survivors Rescued," *USA Today*, September 14, 2008, http://usatoday30.usatoday.com/weather/hurricane/2008-09-14-ike-main_N.htm.

destruction of property and loss of life. The Texas health department attributed 74 deaths in Texas as directly or indirectly related to Ike.[160] Among the lessons learned from Ike was a renewed focus on evacuation centers.

B. SCHOOLS AS SHELTERS

Public sheltering of Texas evacuees is made up of many components. The state's mass-care shelter plan outlines the roles of various agencies—including local schools—in preparing and recovering from a hurricane, as well as the components of an emergency shelter.[161] The Texas Educational Agency (TEA) is charged with "acquiring school facilities and associated personnel to assist in operating shelters and feeding people in shelters."[162] Additionally, the TEA provides transportation for evacuees using public school buses. A letter from the Texas Commissioner of Education Michael Williams to administrators:

> School administrators and designated Education Service Center personnel are urged to work closely with local first responders and emergency management directors in their areas to ensure public school resources are made available in the event that a disaster may require the need of public school buses for evacuation and/or school facilities for temporary shelter. In the event of a hurricane, these public school resources can play a critical role in protecting the life and well-being of Texans in catastrophic conditions.[163]

With schools having such a critical role, it is unclear if an accountability system is in place to ensure that schools are properly funded for the sheltering services they provide. The letter does refer to the laws that would call for the evacuation of a population from a threatened location and the use of school facilities to provide

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[160] David Zane et al., "Tracking Deaths Related to Hurricane Ike, Texas, 2008," *Disaster Med Public Health Prep*. 5, no. 1 (March 5, 2011): 23–8, https://www.ncbi.nlm.nih.gov/pubmed/21402823.

[161] Texas Division of Emergency Management, *The State of Texas Mass Care Shelter Plan* (Austin, TX: Texas Division of Emergency Management, 2010), https://www.preparingtexas.org/Resources/documents/2010%20Hurr%20Conf%20Presentations/Mass_Care_Shelter_Plan.pdf.

[162] Texas Division of Emergency Management, *State of Texas Hurricane Response Plan* (Austin, TX: Texas Division of Emergency Management, 2010), 31, https://www.piersystem.com/external/content/document/5487/1827803/1/texas_hurricane_response_plan.pdf.

[163] Michael Williams, "Texas Schools' Role in the Event of Hurricanes," Texas Education Agency, September 16, 2013, http://tea.texas.gov/About_TEA/News_and_Multimedia/Correspondence/TAA_Letters/Texas_Schools__Role_in_the_Event_of_Hurricanes/.

temporary shelter for evacuees. It stops short, however, in specifying the roles and responsibilities of school staff during evacuation processes.

Following the 2005 hurricane season, Texas adjusted its evacuation procedures, which the U.S. Department of Transportation Federal Highway Administration has recognized as best practices.[164] These practices include communication, evacuation of people with special needs, flow of traffic, and public awareness.[165] However, those practices did not specify improvements for schools as shelters. The recommendations stated only that:

> School districts should feel comfortable making their facilities available for sheltering or logistics during an emergency. State and local government should work with school districts to mitigate their concerns about cost, legal liability, disrupted teaching schedules and loss of teaching days—and this should happen well in advance of a hurricane evacuation.[166]

Stating that districts should "feel comfortable" about transitioning to an emergency shelter is not stringent enough. The assumption is that state and local officials have protocols in place for a seamless facility transition but may not necessarily be the case.

Storm damage in Texas has been costly for school districts. During the 2008 hurricane season, unreimbursed damage to public schools was $72.6 million dollars.[167] The damage or the continued use of school buildings as public shelters has caused prolonged disruptions to education at a number of Texas school districts due either to damage to school facilities or continued use of the facility as a shelter.[168] Ten days after the storm passed, *Education Week* reported, "More than 2 million people in Texas lacked

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[164] "Catastrophic Hurricane Evacuation Plan Evaluation: A Report to Congress," accessed December 24, 2016, https://www.fhwa.dot.gov/reports/hurricanevacuation/appendixe.htm.

[165] Ibid.

[166] Jack Little, *Governor's Task Force on Evacuation, Transportation, and Logistics* (Letter to Gov. Perry) (Austin, TX: Governor's Task Force on Evacuation, Transportation, and Logistics, 2006), http://gov.texas.gov/files/press-office/EvacuationTaskForceReport.pdf.

[167] Office of the Governor, *Texas Rebounds: Helping Our Communities Recover from the 2008 Hurricane Season* (Austin, TX: Office of the Governor, 2008), http://gov.texas.gov/files/press-office/Texas-Rebounds-report.pdf.

[168] FEMA, *Hurricane Ike Impact Report* (Washington, DC: U.S. Department of Homeland Security, 2008), 12, https://www.fema.gov/pdf/hazard/hurricane/2008/ike/impact_report.pdf.

electricity immediately after the storm, and nearly 37,000 Texas spent time in shelters, many at public schools."[169] Getting kids back to school is a factor in establishing a return to normalcy in a community. Houston's school district was closed for weeks following Hurricane Ike due to a lack of power and damage to facilities. In Houston alone, education was disrupted for 200,000 students.[170] Two months after Ike, a state mitigation report indicated that 14 schools remained closed, half of which were closed indefinitely requiring affected students to relocate.[171] With schools either being used as a long-term shelter or schools having been heavily damaged, local school districts have grappled with ways to make up instructional time students missed despite the TEA waiving the minimum education requirement.[172]

Texas faces the challenge for a steady and immediate access to funding before, during, and after a catastrophic event. The TEA "sent $3 million in emergency funds to two school district regions. This money was spent on immediate clean-up and recovery efforts and an additional $1 million was spent on public school emergency shelter costs."[173] Texas emergency officials still refer to the challenges that arose from the destruction, and the lessons learned can be applied to emergency preparations for the future to prevent the prolonged educational disruptions.

C. Safety and Security

Dual-purpose school facilities must function as schools and offer a safe environment for sheltering, and new building codes have been created for this purpose. The northern school districts in Texas sit in the geographic region known as Tornado Alley.[174] Some of those school districts, such as the one in Fort Worth, are adopting new

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[169] Mary Ann Zehr and Erik Robelen, "Hurricane Recovery Proves Slow Going," Education Week, September 23, 2008, http://www.edweek.org/ew/articles/2008/09/24/05storm.h28.html.

[170] Ibid.

[171] Office of the Governor, *Texas Rebounds: Helping Our Communities Recover from the 2008*, 28.

[172] "Texas Schools Allowed to Waive Lost Days to Ike," October 2, 2008, http://www.deseretnews.com/article/700263456/Texas-schools-allowed-to-waive-lost-days-to-Ike.html?pg=all.

[173] Office of the Governor, *Texas Rebounds: Helping Our Communities Recover from the 2008*, 28.

[174] Merrill Hope, "Pricy Tornado Shelters Required on Texas School Campuses," Breibart, November 28, 2016, http://www.breitbart.com/texas/2016/11/28/pricy-tornado-shelters-required-texas-school-campuses/.

building codes issued by the ICC that require schools to have storm shelters. FEMA recommends in accordance with the 2015 IBC that a "shelter must be able to withstand winds in excess of 250 miles per hour, or an EF-4 rated tornado."[175] An Enhanced Fujita (EF)-4 has a wind strength from 166 to 200 mph.[176] School districts adhere to the local government building codes; therefore, it is not known how many other districts will follow Fort Worth's lead in building tornado shelters for new schools.[177] If other districts do not follow similar standards, the reason could be the high costs of these building requirements. Architect Richard Jaynes who designs schools for several Texas districts shared with the *Star-Telegram* that FEMA guidelines are stringent, stating, "The storm shelter must be able to operate independently from the rest of the building for at least two hours with water, electricity and working bathrooms. Cost increases will depend on the size of the shelter and the materials needed."[178] If a school board approves a new construction project, it will have to factor in the 2015 IBC codes that require a storm shelter. A two-story renovation project at one high school received an $18 million sign off from the school for a storm shelter that accommodates 1,200.[179] This example shows how local decisions are setting examples for other districts in Texas.

While Texas counties tackle decisions over how best to meet new building requirements, the state has progressed in other areas of safety and security at public shelters. A concern over criminal background checks at shelters in Texas resulted in a statewide citizen management system. Launched in 2007 by the OAG, Operation Safe Shelter is a service "to aid emergency shelters, raise awareness and protect evacuees," by

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[175] Sandra Baker, "Tornado Shelters for New Schools Will Be Required in Fort Worth," *Star-Telegram*, November 22, 2016, http://www.star-telegram.com/news/local/community/fort-worth/article116435578.html.

[176] "Tornado Scale," accessed January 14, 2017, http://www.tornadofacts.net/tornado-scale.php.

[177] Jason Allen, "Building Codes Require New Schools to Include Tornado Shelters, but Many Won't Have Them," *CBSDFW*, May 25, 2016, http://dfw.cbslocal.com/2016/05/25/building-codes-requiring-new-schools-to-include-tornado-shelters-but-many-wont-have-them/.

[178] Baker, "Tornado Shelters for New Schools Will Be Required in Fort Worth."

[179] Kenny Green, "Mesquite High School to Undergo $18 Million Expansion, Renovation," *Mesquite News*, September 12, 2016, http://starlocalmedia.com/mesquitenews/news/mesquite-high-school-to-undergo-million-expansion-renovation/article_cfcbd50a-795f-11e6-85b6-2787f9d40609.html.

identifying registered sex offenders.[180] This initiative to conduct background checks creates a situational awareness of those seeking refuge in a confined space. Four days after Ike made landfall in September 2008, the Attorney General of Texas released a press release that stated, "After confirming that subjects appeared on the sex offender registry, OAG personnel informed shelter supervisors and local law enforcement officials about the confirmation, thereby enabling authorities to closely monitor the subjects or otherwise respond appropriately."[181] This initiative was also used during Hurricane Ike. According to the Attorney General's office, law enforcement personnel, who were manning the calls, checked 3,300 people who sought refuge in public shelters.[182] Operation Safe Shelter was launched again in 2010 during Hurricane Alex, which made landfall as a Category 2 storm. The initiative was a "24-hour a day, toll-free emergency hotline that … allow[ed] shelter personnel to inquire whether the evacuees [were] registered sex offenders."[183] Tracking registered sex offenders is beneficial for cities like Galveston where, according to the Texas sex offender registry, there is one sex offender among every 306 citizens.[184] However, executing a background check process that results in identification and a segregation of a population comes with challenges for the agencies and volunteers tasked with the work.[185]

In 2009, Texas also established a tracking system for evacuees who have medical issues. The Texas Emergency Tracking Network (TxETN) issues evacuation tracking wristbands and medical asset tags are provided by the state in the event of a hurricane. According to the Coastal Bend Regional Advisory Council, this "assure[s] that evacuating patients may be accounted for and located during the high intensity activity associated with a full scale evacuation or during the many transportation transfers which

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180 "AG's 'Operation Safe Shelter' Checks 3,300 Evacuees during Ike," accessed December 21, 2016, http://www.instantnewswestu.com/ags-operation-safe-shelter-checks-3300-evacuees-during-ike/.

181 "Status Update: Operation Safe Shelter."

182 "AG's 'Operation Safe Shelter' Checks 3,300 Evacuees during Ike."

183 "Attorney General Abbott Activates Operation Safe Shelter during Hurricane Alex," July 1, 2010, https://texasattorneygeneral.gov/oagnews/release.php?id=3378.

184 "Galveston, Texas."

185 Arlikatti, Kendra, and Clark, "Challenges for Multi-Sector Organizations in Tracking and Sheltering Registered Sex Offenders in Disasters," 1547–7355.

may occur during their evacuation and sheltering."[186] The Texas Department of Public Safety has online training resources including tracking implementation guidelines, interface guide, enrollment forms, reception checklist, shelter and embark resources, and criteria for medical special needs processing.[187] The single-colored issued wristbands are equipped with RFID barcodes, which allow for web-based inventory.[188] A RFID is a small device that holds data.[189] The TxETN is considered "critical to an effective emergency response. Information derived from that knowledge can be leveraged by local entities on both the receiving and sending side of the process as well as by emergency management personnel at all levels."[190] Texas continues to enhance its tracking system. In May 2016, the Texas National Guard announced its support in testing what it calls the emergency tracking network, which would allow for more accountability and tracking of individuals following a weather event.[191] A tracking network also adds another layer of security for those evacuees who find themselves in schools that serve as shelters.

C. ROLE OF GOVERNMENT

Texas emergency preparedness efforts exemplify agency collaboration and communications. Sufficient resources are online to communicate preparation tactics, evacuation plans, and steps towards recovery in the aftermath of a storm. Texas provides an online source for emergency preparedness information at *texas.gov*, which houses the

186 "Texas Medical Patient/Evacuee Tracking System & Frequently Asked Questions & Answers," 2009, http://www.cbrac.org/uploads/CBRAC/txsnets.pdf.

187 "Emergency Tracking Network Resources," accessed December 25, 2016, http://www.dps.texas.gov/dem/councilscommittees/etn/etnresources.htm.

188 "Texas Medical Patient/Evacuee Tracking System & Frequently Asked Questions and Answers."

189 "What is RFID?," accessed January 14, 2017, http://www.technovelgy.com/ct/technology-article.asp.

190 Texas Emergency Tracking Network, *2011 Hurricane Season Planning: Evacuee and Shelter Tracking* (Austin, TX: Texas Department of Public Safety, 2011), 2, https://www.dps.texas.gov/dem/CouncilsCommittees/ETN/txETNStatewideTracking.pdf.

191 Daniel Griego, "Texas Guard Members Support Emergency Tracking Network Training," U.S. Army, May 17, 2016, https://www.army.mil/article/168048/Texas_Guard_members_support_Emergency_Tracking_Network_training.

Texas emergency portal.[192] The site is easy to navigate to find emergency guidance for Texans and lists evacuation shelters, which include school sites.

Texas also has dedicated staff to handle the various situations before, during, and following a disaster, a testament to the priority given to emergency preparedness. The state's division of emergency management, or TDEM, manages and staffs the state operations center (SOC) and coordinates the state's emergency management program.[193] Public awareness for emergency preparations is one of the main duties of the TDEM, which is tasked with providing "an extensive array of specialized training for emergency responders and local officials, and administers disaster recovery and hazard mitigation programs in the State of Texas."[194] The emergency management performance grant (EMPG)'s steering committee meets to "determine a strategy for equitable distribution of funding, recognize the legitimate interest of stakeholders and will implement a criteria based on those findings."[195] Having stakeholders involved in the funding process could be cumbersome; however, it adds a critical perspective from those who are tasked with delivering the training and emergency planning. With new IBC standards requiring schools in Texas to be equipped with storm shelters, the EMPG may soon find itself reevaluating its strategies.

Preventive and planning measures for schools are outlined in Texas law under its Education Code. Section 37.109, the Multihazard Emergency Operations Plan: Safety and Security Audit reads:

> Each school district or public junior college district shall adopt and implement a multihazard emergency operations plan for use in the district's facilities. The plan must address mitigation, preparedness, response, and recovery as defined by the commissioner of education or

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192 "Texas Emergency Preparedness," accessed December 27, 2016, https://emergency.portal.texas.gov/.

193 "Emergency Management Operations," accessed December 26, 2016, http://www.dps.texas.gov/dem/Operations/index.htm.

194 "Texas Division of Emergency Management," accessed December 26, 2016, http://www.dps.texas.gov/dem/about.htm Texas.

195 "Emergency Management Performance Grant (EMPG) Working Group," accessed December 27, 2016, http://www.dps.texas.gov/dem/CouncilsCommittees/EMPG/index.htm.

> commissioner of higher education in conjunction with the governor's office of homeland security.[196]

Further, the section calls for reporting the results via a safety and security audit. In executing this education code and the education plans outlined in the Governor's Homeland Security Strategic Plan, Texas has an outlier organization that assists school districts. A research center at Texas State University, the Texas School Safety Center (SSC) "serves as a clearinghouse for the dissemination of safety and security information through research, training, and technical assistance for K-12 schools and junior colleges throughout the state of Texas."[197] The website features an article that places schools accountable for emergency preparedness training. The website states, "It is the responsibility of administrators to ensure staff is trained and the district is adequately prepared to respond to and recover from these incidents. In order to respond and recover effectively, districts must focus their attention on preparedness."[198] While it is the mission of the SSC to serve schools, its role is resource-based. School administrators must take action to seek assistance for training.

Among SSC's safety resources is a severe weather toolkit that recommends school districts develop memoranda of understandings (MOUs) and mutual aid agreements (MAAs) before severe weather threatens.[199] The advisement creates clear roles and responsibilities, but again, neither mandates that school districts establish such roles and responsibilities nor provides input into formulating the agreements.

Implementing the SSC suggestions would be worth the investment of time and resources for liability purposes as well. Among its toolkit is a recommendation that school staff be trained in the National Incident Management (NIMS) and Incident Command Systems (ICS), which are used by emergency agencies during severe

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196 Texas Department of Insurance, *Education Code, Chapter 37* (Austin, TX: Texas Department of Insurance, 2009), https://www.tdi.texas.gov/fire/documents/fmeducationcode.pdf.

197 "About Us, What We Do," accessed December 27, 2016, https://txssc.txstate.edu/about/.

198 "Taking the Next Step in School Preparedness," accessed December 24, 2016, https://txssc.txstate.edu/topics/emergency-management/articles/taking-the-next-step.

199 "Severe Weather Toolkit: 1.0 Severe Weather and Schools," accessed December 27, 2016, https://txssc.txstate.edu/tools/weather-toolkit/weather-schools.

weather.[200] Having staff complete such training would help establish cross-sector collaboration and communication. The toolkit goes further to provide a NIMS chart that determines the roles of the various staff levels within a school district. Finally, the site links to a toolkit that gives school districts an overview of tasks and areas of responsibilities that would emerge should a school close to become a public shelter.

Another layer of emergency preparedness for schools is the requirement of the Texas Association of School Boards (TASB) for school employee training in emergency operations. In communicating what needs to get done, the TASB released a chart describing the necessary training.[201] The State of Texas Hurricane Response Plan requires school drills to be "exercised at least annually in the form of a simulated emergency in order to provide practical, controlled, and operational experience to those who have SOC responsibilities. This requirement is applicable to the SOC and each Disaster District EOC."[202] The amount of required training is sensible given that local schools in Texas have a role in executing the State Mass Care Plan.[203] However, it is not clear whether funding is provided to each school district for training staff.

D. CONCLUSION

Texas has developed a number of resources for school officials to turn to for guidance and information on sheltering practices. However, with so many resources available, school officials must set a priority list on addressing issues. It is valuable to have Texas State University as a leader in producing tools and emergency resources. Texas has also set an example with the RFID-tracking of evacuees. Its initiative not only helps to provide a safe space for those with severe medical conditions but also identifies registered sex offenders in a shelter. On the other hand, Texas still faces the financial challenges of meeting updated building codes. The pieces of the complex school shelter

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[200] "Severe Weather Toolkit: 1.0 Severe Weather and Schools."

[201] Texas Association of School Boards, Inc., *Emergency Operations* (Austin, TX: Texas Association of School Boards, Inc., 2016), 12, https://www.tasb.org/Services/Legal-Services/TASB-School-Law-eSource/Personnel/documents/sch_dist_trng_chart_2016.pdf.

[202] Texas Division of Emergency Management, *State of Texas Hurricane Response Plan*, 41.

[203] Texas Division of Emergency Management, *The State of Texas Mass Care Shelter Plan*.

puzzle are all there. Texas must make the right connections through an assessment of how its resources are being used, and determine solutions beyond the financial obstacles in building and retrofitting schools with sheltering as a priority.

V. ALL FOR ONE: JAPAN

From its response to record-breaking earthquakes and its fierce typhoons, Japan has much to offer by way of best practices in emergency preparation for catastrophic events. The island nation is located 3,850 miles northwest of Hawaii.[204] A tropical cyclone in the Northwest Pacific is called a typhoon and Japan has experienced many.[205] The Pacific Typhoon Season runs from May to October. Typhoons have affected Japan with their strong winds and heavy rains that trigger landslides and rising waters.[206] Japan's population is 127 million and despite the continual threat of national disasters, the nation boasts the longest life expectancy in the world.[207] As this chapter shows, Japanese live in a homogenous society where knowledge and values are passed on from generation to generation. This Japanese cultural system enables the safety and security of many during a catastrophic event.

A. OVERVIEW

Japan has learned many lessons over decades of destruction caused by catastrophic weather. A turning event occurred in 1959 when Central Japan experienced devastating flooding from the Isewan Typhoon, which caused record damage to Nagoya city and the surrounding region.[208] That city sits next to Ise Bay where storm surges reached 13 feet and resulted in an estimated 5,100 deaths.[209] The Isewan Typhoon, also known as Super Typhoon Vera, resulted in damages that totaled $1.9 billion at that

[204] "Geography of Hawaii," accessed January 2, 2017, http://www.to-hawaii.com/geography.php.

[205] "What Is the Difference between a Hurricane, a Cyclone, and a Typhoon?," accessed January 2, 2017, http://oceanservice.noaa.gov/facts/cyclone.html.

[206] "Typhoons," accessed January 2, 2017, http://www.japan-guide.com/e/e2117.html.

[207] "Japan Population (2016)," accessed January 9, 2017, http://countrydigest.org/japan-population/.

[208] Japan Water Forum, *Typhoon Isewan (Vera) and Its Lessons* (Nihonbashi-Hakozaki-cho, Chuo-ku, Tokyo: Japan Water Forum, 2005), 3, http://www.waterforum.jp/jpn/katrina/Typhoon_Isewan.pdf.

[209] "55th Anniversary of Typhoon Vera or the 'Isewan Typhoon,'" September 25, 2014, https://noaa hrd.wordpress.com/2014/09/25/55th-anniversary-of-typhoon-vera-or-the-isewan-typhoon.

time.[210] It is still considered one of the most deadly typhoons to strike Japan in recent time and resulted in the country's focus on emergency preparation.

In the aftermath of Super Typhoon Vera, the country enacted the Disaster Countermeasures Basic Act, which became a turning point for disaster prevention systems in Japan.[211] The Act declared September 1 "Disaster Day" and the week from August 30 to September 5 "Disaster Week."[212] These symbolic events not only remind the country of the lives lost but also encourage annual emergency preparedness participation by all Japanese citizens. The culture shift toward emergency preparedness in Japan may have helped save lives when a magnitude 9.0 earthquake struck on March 11, 2011, resulting in a severe tsunami.[213] The event is known as the Tohoku earthquake or Great East Japan Earthquake.[214] Japan's early warning system alerted people an hour before the quake struck that afternoon.[215] Tsunami warnings were activated and following the quake waves traveled throughout the Pacific Basin reaching as far as the west coast of the United States.[216] Following the quake, a series of tsunami waves destroyed coastal areas and caused a nuclear power plant accident.[217] Of the more than 15,000 deaths accounted for, many were the result of drowning.[218]

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[210] Risk Management Solutions, Inc., *1959 Super Typhoon Vera: 50-Year Retrospective* (Newark, CA: Risk Management Solutions, Inc., 2009), http://forms2.rms.com/rs/729-DJX565/images/tc_1959_super_typhoon_vera.pdf.

[211] Japan Water Forum, *Typhoon Isewan (Vera) and Its Lessons*, 3.

[212] Government of Japan, *Japan's Natural Disaster and Early Warning Systems and International Cooperative Efforts* (Chiyoda-ku, Tokyo: Cabinet Office, 2006), http://www.bousai.go.jp/kokusai/kyoryoku/pdf/soukikeikai.pdf.

[213] Becky Oskin, "Japan Earthquake & Tsunami of 2011: Facts and Information," *Live Science*, May 7, 2015, http://www.livescience.com/39110-japan-2011-earthquake-tsunami-facts.html.

[214] Ibid.

[215] Ibid.

[216] Richard Lovett, "Tsunami Waves Hit U.S.—Some Damage in Hawaii, California," *National Geographic News*, March 12, 2011, http://news.nationalgeographic.com/news/2011/03/110311-tsunami-us-nation-earthquake-japan-hawaii-science-california-waves/.

[217] *Encyclopedia Britannica*, s.v. "Japan Earthquake and Tsunami of 2011," last modified May 13, 2016, https://www.britannica.com/event/Japan-earthquake-and-tsunami-of-2011.

[218] Oskin, "Japan Earthquake & Tsunami of 2011: Facts and Information."

The widespread damage in Japan included school buildings, some of which had met existing earthquake resistance standards.[219] Since the Great East Japan Earthquake, many studies have assessed Japan's emergency preparations, response, and lessons learned. This chapter considers Japan's disaster preparation for natural events, such as typhoons, volcanic eruptions, earthquakes, and tsunamis. It examines how schools are incorporated into emergency planning as evacuation sites and what lessons can be gained from the country's experience.

B. SCHOOLS AS SHELTERS

One of the key areas of Japan's disaster planning is having a coordinated response system that focuses on evacuation shelters. During the Great East Japan Earthquake, in lower elevation areas, faculty, staff, and students from schools and the surrounding community used the upper floors of buildings and the rooftops as emergency evacuation sites.[220] For several months after the earthquake, many public elementary and middle schools served as emergency shelters for people who had lost their homes.[221] With many people displaced, schools are a crucial part from the transition from disaster to recovery.

Following the Great East Japan Earthquake, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) formed the Study Group on Disaster-resilient School Facilities, comprised of experts in disaster social engineering, disaster prevention education, and other related fields, to examine tsunami protection measures of school facilities and their role as evacuation shelters.[222] Japanese officials recognized the need for developing disaster-resilient school facilities with input from the government, school officials, emergency management, and residents. The MEXT sought to enhance Japan's

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[219] Committee for Research Studies on the Visions of School Facilities, *Ideal State of Disaster-Resilient School Facilities—Tsunami Protection Measures and Enhancement of Disaster Prevention Function as Evacuation Shelter* (Chiyoda-ku, Tokyo: Ministry of Education, Culture, Sports, Science and Technology, 2014), 6, https://www.nier.go.jp/shisetsu/pdf/e-disaster-resilient.pdf.

[220] Ibid., 11.

[221] "Kids Web Japan," accessed January 15, 2017, http://web-japan.org/kidsweb/explore/schools/q6.html.

[222] Committee for Research Studies on the Visions of School Facilities, *Ideal State of Disaster-Resilient School Facilities—Tsunami Protection Measures and Enhancement of Disaster Prevention Function as Evacuation Shelter*.

community disaster management capacity. It addressed the essential role schools have in both its facility use as a shelter and disaster prevention education and drills, and the role that local residents have in aiding others.[223] The Japanese public, then, serves as an active participant for community emergency preparedness.

Among the recommendations made by the study group was a need to establish a relationship between the emergency evacuation sites and shelters at schools. The report stated:

> If school facilities are to be designated as an emergency evacuation site or evacuation shelter, it is important for the municipality's personnel in charge of disaster prevention and those in charge of school facilities to define before the designation which part of the facilities shall be designated and thoroughly notify the school and community accordingly.[224]

This recommendation has been applied in some areas of Japan to ensure security and safety at the school facility and surrounding areas. Doing so places the dual purpose of schools as shelters at the forefront of emergency planning.

Facility design anticipates dire events, particularly for earthquakes that can shift buildings and weaken foundational supports.[225] Damage assessments from the Great East Japan Earthquake reinforced the need for inspections and public school building improvements. In 2012, the Ministry of Education set a goal of strengthening structures to make them earthquake resilient and visited schools to make sure these facility improvements were taking place.[226] Facility renovations are required for about 70 percent of the country's elementary and middle schools because they are at least 25 years

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[223] Committee for Research Studies on the Visions of School Facilities, *Ideal State of Disaster-Resilient School Facilities—Tsunami Protection Measures and Enhancement of Disaster Prevention Function as Evacuation Shelter*, 11.

[224] Ibid., 4.

[225] William Chen and Daniel Li, "Gyroscopically Stabilized Building," MIT THINK Scholars, accessed January 15, 2017, http://think.mit.edu/2014/gyroscopically-stabilized-building/.

[226] "Special Feature 2: Building a Safe and Secure Educational Environment," accessed January 15, 2017, http://www.mext.go.jp/b_menu/hakusho/html/hpab201201/detail/1344912.htm.

old.[227] According to a writer from the *Japan Times* in June 2016, the education ministry announced inspections for all public schools nationwide to ensure they can serve as emergency shelters.[228] Again, this statement is a testament to Japan's prioritizing of schools for a dual purpose.

C. SAFETY AND SECURITY

Disaster preparedness in Japan is ingrained in its culture. In addition to the national week of disaster preparedness, Japan schools perform earthquake drills monthly.[229] Children are taught how to be ready for earthquakes and tsunamis, and schools are stocked with necessary emergency tools. Peter Foster states, "For those trapped, all offices and many private houses in Japan have … earthquake emergency kits, including dry rations, drinking water, basic medical supplies. Offices and school[s] also keep hard-hats and gloves for use in the event of a quake."[230] Experiences have taught Japanese citizens to be prepared for an earthquake at all times.

When assessing the Great East Japan Earthquake, seismologists realized they had not identified the location of the seismic activity as an area that would generate a catastrophic quake.[231] Geophysicist Roland Burgmann stated, "What was unexpected was how large [the March 11 quake] was. There have been large earthquakes sprinkled over the plate in the last hundred years, but none of them were nearly as big as this one."[232] It struck on a Friday afternoon when schools were still in session and upon hearing the warning, students diligently performed earthquake and evacuation

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[227] JiJi, "Government to Check Whether Nation's Aging Public Schools Can Be Used as Emergency Shelters," *The Japan Times*, June 19, 2016, http://www.japantimes.co.jp/news/2016/06/19/national/government-check-whether-nations-aging-public-schools-can-used-emergency-shelters/#.WHwSLfPATAo.

[228] Ibid.

[229] "Kids Web Japan."

[230] Peter Foster, "Japan Earthquake: Country Better Prepared than Anyone for Quakes and Tsunamis," *The Telegraph*, March 11, 2011, http://www.telegraph.co.uk/news/worldnews/asia/japan/8375591/Japan-earthquake-country-better-prepared-than-anyone-for-quakes-and-tsunamis.html.

[231] Devin Powell, "Japan Quake Location a Surprise," *Science News*, April 9, 2011, https://www.sciencenews.org/article/japan-quake-location-surprise.

[232] Sarah Fecht, "Why Japan's Massive Earthquake Surprised Scientists," *Popular Mechanics*, March 11, 2011, http://www.popularmechanics.com/science/environment/a11822/why-japans-massive-earthquake-surprised-scientists-5382984/.

exercises.[233] However, not all students survived. Eleven days after the event, at least 125 students from kindergarten to college were confirmed dead and about 1,600 were still missing across Japan's northeastern coast.[234] The loss of life and severe property damage likely generated more research in locations in Japan that had not previously been considered threatened. In furthering its study, MEXT evaluated schools not initially considered within the tsunami threat area, resulting in changes to evacuation site considerations.[235]

Japanese planners recognize evacuation sites involve people congregating at schools and their borders. As a result, Japan requires escape paths for facilities that serve as emergency evacuation sites should the safety of surrounding areas be threatened by an incoming tsunami.[236] Other functions that Japan deems necessary for a school evacuation sites include having them equipped with a "stockpile warehouse on an elevated area in the vicinity, the rooftop of a school building or other places free from the risk of flooding."[237] Moreover, schools designated schools as tsunami evacuation buildings are designed and updated with building specifications to meet the growth of the area. Installations include emergency lighting and double handrails for the elderly and for small children.[238] Japan's considerations for all generations are instilled in the emergency planning and building design. This holistic approach to school design serves the community at large.

In the town of Kuroshio in Japan's Kochi prefecture, safety-measure planning and implementation is a community effort. Kuroshio has prepared for emergencies based on

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[233] Sawaji Osamu, "Education and Disaster Reduction," *The Japan Journal*, February 2012, http://www.japanjournal.jp/home/wp-content/uploads/2012/02/1202e_06-10_CoverStory.pdf.

[234] John Glionna, "Parents in Japan Comb through School Now a Graveyard," *Los Angeles Times*, March 22, 2011, http://articles.latimes.com/2011/mar/22/world/la-fg-japan-school-20110323.

[235] Committee for Research Studies on the Visions of School Facilities, *Ideal State of Disaster-Resilient School Facilities—Tsunami Protection Measures and Enhancement of Disaster Prevention Function as Evacuation Shelter*, 14.

[236] Ibid., 15.

[237] Ibid., 24.

[238] Ibid., 25.

the probability of a Nankai Trough earthquake occurrence.[239] A goal for the town is developing school facilities outside areas that have a high probability of flooding, and in the meantime, its citizens are developing emergency evacuation sites and escape paths for its schools in the short term.[240] One of the town's schools, Nango Elementary, has an escape path behind the facility. Nango's evacuation drill consists of students running up the escape stairs to the top within three minutes, which along with other school and town drills, is performed 15 times a year.[241] Kurushio's collective approach showcases the value it places on those who live there. The emphasis of disaster education in schools empowers students to understand their environment and to take action in saving themselves and assisting those around them.[242] Much can be learned from looking at safety and security through Japan's community-value system approach.

Although Japan plans for generational needs during an emergency, it lacks measures for crime prevention in a public shelter. Some earthquake-stricken regions have reported cases of assaults on women and children.[243] *Japan Today* published an article that stated, "According to project representatives, numerous cases of rapes, sexual assaults and groping that targeted women and children, were reported after the Great Hanshin Earthquake in 1995."[244] Following the 7.0 magnitude earthquake that struck Kumamoto on April 16, 2016, a Japanese agency distributed flyers that warned evacuees to be aware of their surroundings and also alerted women to past cases of sexual assault in shelters.[245] While this initiative is another example of community approaches to handling challenges in emergency shelters, a more vigilant effort is needed through increased law enforcement.

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[239] Jiji, "Quake Risks Rise in Areas along Nankai Trough," *Japan Times*, June 13, 2016.

[240] Committee for Research Studies on the Visions of School Facilities, *Ideal State of Disaster-Resilient School Facilities—Tsunami Protection Measures and Enhancement of Disaster Prevention Function as Evacuation Shelter*, 25.

[241] Ibid.

[242] Osamu, "Education and Disaster Reduction," 4.

[243] "NGOs Warn Evacuees of Possible Sexual Assaults in Shelters," April 21, 2011, https://www.japantoday.com/category/lifestyle/view/ngos-warn-evacuees-of-possible-sexual-assaults-in-shelters.

[244] Ibid.

[245] Otake, "Sex Assault Likely at Evacuation Centers, Groups Warn."

D. ROLE OF GOVERNMENT

Since 1961, Japanese laws have been in place for disaster management.[246] Beyond its national and local disaster management plans, the Disaster Countermeasures Basic Act provides a "basic template to be used by disaster managers at the central, prefectural, and local level to construct their disaster plans." The template also emphasizes preparedness while prioritizing recovery plans. Furthermore, it recognizes the importance of having room for flexibility. Emergency management reforms for telecommunications were introduced after the 1995 Kobe earthquake to address the importance of adjusting to advancing technologies.[247]

A number of agencies are assigned roles to work at the local levels in establishing shelters for affected communities including the International Red Cross Japanese affiliate known as *Nippon Sekijūjisha*, or the Japanese Red Cross Society. Similar to the U.S. Red Cross, it has chapters set up across the country. The society also operates 92 Red Cross hospitals and 79 blood centers throughout Japan.[248] Shelter planning in Japan is done at several levels: regional, community, neighborhood, and primary (in residence). According to the Japanese Disaster Management System:

> In the event of a disaster occurring, municipalities will primarily be engaged in emergency countermeasures as they are the closest to residents. Prefectural administration will get involved when the comprehensive wider-area measures are necessary. In the event of a large-scale disaster beyond the capability of local public entities struck by the disaster, national government will step in to support the local entity and coordinate mutual support among the local entities.[249]

The multi-tiered approach is focused not only on the sheltering of citizens but also on the overall response to emergency countermeasures.

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[246] Government of Japan, *National Report of Japan on Disaster Reduction* (Kobe-Hyogo, Japan: Government of Japan, 2005), https://www.unisdr.org/2005/mdgs-drr/national-reports/Japan-report.pdf.

[247] Marcus Noland, "Does Japan Need a FEMA?" Peterson Institute for International Economics, March 31, 2011, https://piie.com/blogs/realtime-economic-issues-watch/does-japan-need-fema.

[248] *Wikipedia*, s.v. "Japanese Red Cross Society," last modified January 3, 2017, https://en.wikipedia.org/wiki/Japanese_Red_Cross.

[249] Cabinet Office, Government of Japan, *Disaster Management in Japan* (Chiyoda-Ku, Tokyo: Cabinet Office, Government of Japan, 2015), 11, http://www.bousai.go.jp/1info/pdf/saigaipamphlet_je.pdf.

As mentioned earlier, a major earthquake in Japan has a rippling effect throughout the pacific region. Therefore, Japan works with the international community on early warning preparedness. In 2005, the Early Warning Sub-Committee of the International Cooperation for Disaster Reduction was formed. It comprises other government agencies and disaster reduction organizations to improve early warning capabilities worldwide. Japan has sophisticated early warning systems throughout the country. This sophistication is evident in its commitment to "incorporate systems for sharing warning information among relevant organizations and disseminating it to residents, and incorporate disaster reduction awareness outreach and education activities to ensure that more timely and appropriate disaster reduction actions are taken based on the warning information issued."[250] Additionally, Japan's Disaster Management Office produces an *Implementation Handbook for Disaster Resilience Education at the Regional Level* for use by authorities, schools, and local organizations.[251] For all these systems described by the handbook as "self-help," "mutual help," and "public help," the critical role of public schools is not underestimated. The handbook describes self-help as "safeguarding one's own life," mutual help as "helping each other and protecting their community," and public help as "public support at the hands of administrative bodies."[252] These proactive tactics and shared responsibilities bolster disaster resilience.

E. CONCLUSION

The disaster experiences in Japan show that sheltering is needed for evacuees until they are able to transition back to a place of residence. More must be done to ensure the security is in place to prevent assaults on vulnerable populations within a shelter that lacks privacy. On the other hand, Japan has rightly invested time and resources to ensure communities have taken steps before disaster strikes.

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[250] Government of Japan, *Japan's Natural Disaster and Early Warning Systems and International Cooperative Efforts*, 3.

[251] Executive Committee for Disaster Management Education Challenge Plan, *Implementation Handbook for Disaster Resilience Education at the Regional Level* (Chiyo, Tokyo: ku-Chiyo, Cabinet Office (Disaster Management Office), 2015), http://www.bousai.go.jp/kyoiku/pdf/h27bousaikyoiku_guidline_en.pdf.

[252] Ibid.

As noted earlier, Japan has a large elderly population; therefore, incorporating designs for seniors and those with special needs in school buildings is responsible community planning. The directive approach to disaster preparedness and the use of schools as shelters lessens risk.[253] Additionally, emergency planning and preparation is always taking place because the country is tested continually with earthquakes, typhoons, and tsunamis. When students return from summer break, most schools hold evacuation drills as part of the country's back-to-school events, and additionally have monthly drills.[254] Japan's proactive management methods in disaster education and implementation of school designs for sheltering are a model that other countries are already emulating.[255] Coastal states in the United States—but particularly Hawaii—may want to consider adopting initiatives similar to Japan's. There is much that the island state of Hawaii can learn from the community value system that exists in the island nation of Japan.

[253] Alex Greer, *Earthquake Preparedness and Response Comparison of the United States and Japan* (Reston, VA: American Society of Civil Engineers, 2012), 7, http://ascelibrary.org/doi/pdf/10.1061/(ASCE)LM.1943-5630.0000179.

[254] "Disaster Prevention Day, Kids Web Japan," accessed September 5, 2016, http://web-japan.org/kidsweb/explore/calendar/september/bousai.html.

[255] Osamu, "Education and Disaster Reduction."

VI. SCHOOLS AS SHELTERS: ANALYSIS

The activation of schools as public shelters during catastrophic events is critical to ensuring the safety and security of citizens. In the jurisdictions examined, severe storms pose the greatest threats to coastal communities. Based on its geography and isolation, the island state of Hawaii runs the risk of being devastated by a tropical storm or hurricane. As Hawaii's coastal populations grow, more must be done to ensure that those living in evacuation zones have safe shelters to which they can retreat. This chapter analyzes solutions from Florida, Texas, and Japan and their appropriateness for Hawaii. Recommendations for Hawaii are made to strengthen its emergency preparedness in using schools as shelters. The areas of analysis include the practice of maintaining schools as shelters, mitigating security and safety, and the establishing role of government.

A. SCHOOLS AS SHELTERS

School facilities are commonly designated as emergency shelters because they have a structure designed to withstand strong winds and the ability to hold a large number of people, as noted in Chapter II. Although Hawaii issues a list of possible hurricane evacuation shelters for the public, the Hawaii State Department of Education (HIDOE) has not established design requirements for schools as shelters. The following recommendations provide options for consideration.

1. Recommendation 1: Create Shelter Criteria for Hawaii Public Schools

To assist states with deciding a facility's shelter suitability, the American Red Cross published Standards for Hurricane Selection (ARC 4496). The guidelines provide the risks states ought to consider in making shelter determinations; however, the ARC 4496 is only supplemental information. States should do more to ensure shelters meet the prescribed guidelines by having its own shelter criteria. For example, Florida mandates hurricane-strength building standards for schools. Furthermore, Florida's Statewide Emergency Shelter Plan specifies that public schools serve as the primary source of public shelters for weather emergencies, and as such, has established design requirements

for Florida's schools designated hurricane shelters. Moreover, Florida expanded its laws on education facilities as emergency shelters, which required its education department to develop criteria with its local emergency management agency.

In addressing the dangers posed by severe weather, Japan takes a national approach at designing schools to meet sheltering designs. The result is beneficial to all citizens, instead of only certain regions. The United States lacks this national approach, instead leaving states and local jurisdictions to update and mandate shelter criteria on their own. A statewide shelter criteria approach would be an ideal option for the Hawaiian Islands; however, the state has yet to mandate a statewide shelter plan. The Hawaii legislature should therefore make this area a priority and mandate statewide criteria for schools that serve as shelters.

Notably, in Hawaii 2005 Hurricane Criteria Selection Committee report, a recommendation was made that Hawaii consider the approach of establishing shelter criteria laws as Florida has done. Hawaii should revisit the report to implement legislation that requires any facility used as a shelter to adhere to the latest EHPA and IBC standards for shelter facilities. In addition, Hawaii does not adequately inventory schools as shelters to know what facilities would house the greatest number of evacuees. By prioritizing what shelters would be used the most, Hawaii can target resources for retrofitting these schools to lessen the cost of rebuilding school facilities as shelters. Additionally, Hawaii should follow Florida's lead whereby the emergency management division collaborates with relevant agencies in preparing a statewide emergency shelter plan that addresses sheltering needs. Having a collaborative structure in place would ensure across-the-board communications versus a silo approach. This approach should be taken through a MOU that describes the roles and responsibilities of preparing schools that become hurricane or tsunami evacuation shelters.

2. Recommendation 2: Reevaluate Resources for Schools as Shelters

Planning and preparation for major weather events are essential to emergency management. Hawaii currently has no allocated funds for the upkeep or retrofitting of facilities for sheltering. Hawaii could apply for FEMA disaster mitigation grants as a

funding source to put toward its efforts; however, applying for and executing such grants require adequate resources.[256] Grant applications are a tedious process that requires knowledgeable staff to execute them properly to be considered. On the other hand, the Governor's Hurricane Conference in Florida provides a replicable resource for providing workshops on an annual basis. Hawaii's governor should establish a similar conference by pulling emergency agencies together to hold workshops, training, and informational booths. Even if Hawaii were to do this, the lack of funding resources would remain. It may raise awareness, but it would not necessarily effect change in providing resources for schools as shelters.

If the Hawaii State Emergency Management Agency requests state funding, Hawaii would likely face the push-back that many Texas education boards have experienced. While one school district in Texas has made a commitment to dedicate funding for retrofitting schools, not many other districts have followed suit because of the expense. It is important to note that Hawaii would not face the problem of an across-the-board decision-making process. Unlike other states that have local education agencies with various boards, Hawaii's public school system is a state education agency, governed by one board of education.

Hawaii's criteria and access to informational resources for schools as shelters are lacking compared to those of Texas, where emergency-preparedness resources are available and accessible at all times. Texas schools receive direct assistance from the Texas School Safety Center at Texas State University. Disseminating safety and security information to K-12 schools and junior colleges throughout the state of Texas is a key component in preparing organizations for emergencies. Proper emergency training is therefore provided with support from an outside agency. In other words, schools districts are not abandoned in their preparation efforts for catastrophic events. Hawaii would benefit greatly from establishing a partnership between its education department and a third party that can assist schools on a regular basis. Based on the example set by Texas, Hawaii should reevaluate the resources provided by its emergency agency and consider

[256] "Pre-Disaster Mitigation Grant Program," last updated November 9, 2016, https://www.fema.gov/pre-disaster-mitigation-grant-program.

establishing an office to serve the same purpose as the Texas School Safety Center. The HIEMA is an ideal agency to house a branch that serves educational agencies across the state because it already coordinates with officials when county emergency agencies activate schools as emergency shelters. Establishing this office, however, would require legislative action.

Contrary to Texas and Hawaii, Japan has a national system that recognizes the need for developing disaster-related school facilities with input from a variety of stakeholders. A strategic working collaboration exists between Japan's emergency agencies, the public at large, and schools. A key resource, then, is the public that schools serve. Should Hawaii adopt a collaborative approach with community stakeholders, more attention would be given to emergency preparedness, as well as increased awareness of the abilities that schools have in serving as shelters.

B. SAFETY AND SECURITY

Storm shelters provide a safe zone from the dangers presented by a severe storm. Nevertheless, in the midst of a chaotic situation, safety and security can be compromised. The following recommendations address options to ensure safety and security measures are in place before and during the sheltering of evacuees.

1. Recommendation 3: Increase Training

Disaster preparedness is a high priority in Japan. Therefore, having proper resources in place along with public training practices exist across jurisdictions. The fewer number of natural events as compared with Japan does not warrant the same level of heightened resources for emergency preparedness. Moreover, the isolation of the 50th state places it at a higher risk as compared to other states and makes the need for appropriate emergency preparedness exercises and resources greater. By investing in public training practices, Hawaii residents would be more aware and more attention would be given not only to shelter improvements, but also to the training of school administrators and personnel on their roles in managing schools as emergency shelters, which is lacking. Although Hawaii marks the month of April as Tsunami Awareness Month, no statewide or countywide evacuation drills are conducted. Instead, schools are

empowered to make their own decisions on whether to hold evacuation drills. Japan holds school drills in conjunction with national evacuation and emergency preparedness exercises.

Establishing an annual event in Hawaii that encompasses communities statewide would allow schools, neighboring residents, and businesses to analyze the level of preparedness that exists. Large-scale exercises would also shed light on what type of training school officials must have to transition their campuses successfully to a public shelter. Such drills would also provide partnering emergency agencies an understanding of what takes place at the school level. An annual statewide drill would expose the existing risks and weaknesses in preparation efforts. Most importantly for Hawaii, emergency and government leaders will recognize the priority of schools as safe havens for communities. Having a large-scale emergency evacuation exercise for tsunami zones would increase awareness, and identify gaps.

The Governor's Hurricane Conference in Florida provides over 300 hours of training and workshops that showcase best practices for managers to apply at their organizations. As mentioned earlier, Hawaii should hold a similar conference and would benefit greatly from having training and workshops led by those who lead these workshops in Florida. Should Hawaii hold such a conference, it could result in an increased level of awareness to prioritize emergency preparedness by all government agencies and community organizations.

2. Recommendation 4: Consider Shelter Check-in and Tracking Process

Schools that are activated shelters become confined spaces that temporarily house a large number of people. The lack of a background check system for individuals who enter shelters poses a risk of contamination by medically contagious persons and a safety risk to those who could become vulnerable to criminals, including convicted sexual predators. The situational awareness provided by a background check goes beyond knowing whether someone is medically contagious or a criminal. According to the American Diabetes Association, nearly 600,000 people in Hawaii have diabetes or have

prediabetes.[257] If one or more of those persons come to a school that is an activated hurricane shelter, those managing the shelter should have an understanding of what the medical needs are to ensure they are safe and to know what to do in the event of a medical emergency. For Hawaii school administrators who stay at their school facilities to assist with management, to know who is on the premises during an evacuation event, a communication system must be in place that allows them to connect with law enforcement or medical personnel.

In contrast, Texas has developed a number of resources for school officials to turn to for guidance and information on sheltering practices through its collaboration with Texas State University. Texas has established a background check system for evacuees using RFID, which helps to provide a safe space for those with severe medical conditions and also identifies registered sex offenders in a shelter. Hawaii may not have the capabilities to establish a RFID-tracking of its evacuees; however, emergency officials should consider partnering with Hawaii's university system to discuss what capabilities exist to begin a tracking system similar to Texas.

When Hawaii schools become activated public shelters, Red Cross volunteers are the lead agents who serve families and individuals seeking safe places in their communities. Establishing a RFID system may not be feasible for Hawaii at this time due to cost and the lack of a designated organization to oversee the operation. Nevertheless, it is worth discussing with law enforcement and emergency agencies on potential processes.

C. ROLE OF GOVERNMENT

Applying best practices for emergency preparedness of shelters and building code criteria necessitates ongoing oversight. Although severe storm experiences may be rare, it only takes one devastating weather event to destroy a community. Thus, assigned agencies or leaders should hold themselves accountable for the management of schools as shelters.

[257] "Honolulu, Hawaii," accessed February 11, 2017, http://www.diabetes.org/in-my-community/local-offices/honolulu-hawaii/.

1. Recommendation 5: Improve Shelter Management Practices

Information and direction within the chain of command is lacking in Hawaii's emergency management efforts regarding schools as shelters. Roles of responsibility must be clearly defined for the bureaucratic agencies of HIDOE and HIEMA. Florida exemplifies that established laws set a standard of management and oversight makes a difference in the preparation. The Statewide Emergency Shelter Plan Law in Florida provides direction for its emergency management division and district school boards to dedicate resources towards public hurricane shelters. Florida's governor and cabinet also have a role in approving the plan submitted by the state's emergency management division. This type of accountability is needed in Hawaii if it is to tackle the challenges it faces in ensuring safe emergency shelters

2. Recommendation 6: Identify Lead Agencies then Collaborate

Emergency management divisions in Hawaii include a state agency and four county agencies. When a severe storm approaches, the agencies are in communication throughout the event. However, prior to a storm season or event, lack of attention by these agencies to fill the gaps that exist in sheltering needs is apparent. In other words, oversight responsibility in the preparation of hardening schools for shelter purposes is lacking. Hawaii should learn from Florida where its emergency agency is the lead in collaborative efforts with the education department to firm up shelter space and implement shelter plan actions. Hawaii's last acknowledgement of emergency procedures for sheltering purposes date back to 1998; therefore, the efforts made by each organization, which includes the local Red Cross, should be revisited and updated.

Another approach taken by Texas is the establishment of the Texas School Safety Center at Texas State University. With the amount of informational resources and complex issues that could arise during an emergency event, the existence of this school safety center offers school staff consistent support. Hawaii should build upon the example of Texas by not only establishing a center within the Hawaii university system that is a clearinghouse of resources, but also use it to facilitate collaboration between the

various emergency agencies, school officials, and other stakeholders. Appropriate attention can therefore be paid by each agency with regard to schools as shelters.

3. Recommendation 7: Appropriate Funding for Schools as Shelters

All cases examined in this thesis suffer from funding challenges for the construction and retrofitting of schools for shelters. Unlike Texas and Hawaii that have not budgeted state funds for this purpose, Florida's governor budgeted $526 million towards educational infrastructure. Since Florida already has laws in place that mandate the construction of educational facilities to be built to function as an emergency shelter, a clear indication exists that the state uses school space for sheltering and is therefore dedicating funding for that purpose.

Moreover, Japan not only dedicates funds to build disaster-resilient school facilities, but also requires the input of government, school officials, emergency management, and residents. Although Hawaii currently does not dedicate funding for schools as shelters, Hawaii should consider creating a policy that would allow for a funding source for schools as shelters.

D. CONCLUSION

Hawaii faces major challenges in the use of schools of shelters, the safety and security of these facilities as shelters, and the lack of governance to implement solutions adequately. Florida, Texas, and Japan provide possible solutions to these challenges. As explained in this chapter, some areas in Hawaii should begin to make changes to its policies now, beginning with revisiting its 2005 Hawaii Shelter Criteria report.

VII. SHELTERING FROM THE STORM: CONCLUSION

Scientists posit that storm activity is becoming more intense due to climate change.[258] Therefore, all states, especially those in coastal areas, must prepare for a catastrophic event. Florida, Texas, and Japan are examples of locations that have a higher risk of natural hazards as compared to Hawaii. Nevertheless, for the remote state of Hawaii to be prepared for a Category 4 hurricane, more attention is required to harden its school facilities that serve as evacuation shelters. For Americans to be prepared for the strong storms and hurricanes, the DHS must take a serious look at how states are ensuring the safety and security of evacuees when a hurricane approaches. Ensuring that shelter facilities are capable of safeguarding evacuees is imperative for protecting lives. The majority of shelters are schools, but Hawaii's safety and security standards for schools as shelters are deficient. This challenge, coupled with a lack of management and training of school officials, must not be ignored. Instead, Hawaii should improve these shelters by adopting standards and practices that have been adopted by Florida, Texas, and Japan.

A. RECOMMENDATIONS FOR FUTURE RESEARCH

In May 2016, the National Mitigation Investment Act (NMIA) was introduced in Congress. The proposed federal legislation aims to make changes to FEMA that will encourage and equip states and local governments around the nation to build more resiliently.[259] However, to truly equip pre-disaster mitigation in communities requires looking beyond the hardened structures of homes and businesses. More research is needed regarding the allocation of FEMA funds. For schools to be constructed in ways that meet the highest building standards for sheltering, more oversight over building structures to meet ICC 500 compliance is needed. This would result in states giving attention and resources to schools as shelters.

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[258] "Storms are Getting Stronger," *NASA Earth Observatory*, accessed February 25, 2017, http://earthobservatory.nasa.gov/Features/ClimateStorms/page2.php.

[259] H.R. 5177 (114th): National Mitigation Investment Act (2006), https://www.govtrack.us/congress/bills/114/hr5177.

Further research should also be pursued on the role Hawaii's Red Cross provides for the training of shelter management at various facilities. Specifically, what role is expected of school administrators and staff in working with Red Cross volunteers and officials? Expectations of volunteers as shelter managers should be clarified to provide accountability of responsibilities within emergency shelters.

Lastly, a closer look into the RFID tracking system and background check system initiated by Texas is needed. Analysis on that system would provide valuable information to determine what lessons can be learned, so that other states can improve upon them should the system be implemented elsewhere.

B. CONCLUSION

This thesis examines practices and policies to aid Hawaii in improving its use of schools as public shelters during severe weather. In the practice of using schools as public shelters, this thesis: (1) presented practices and policies that already exist, (2) analyzed challenges and solutions, and (3) explored the government's role.

State of Hawaii policies are needed to establish a system that allows for the hardening and maintenance of school shelters, training of shelter volunteers and school staff along with periodic evacuation drills, safety and security measures, and appropriate resources. By prioritizing these areas of concerns through legislation, the necessary attention toward schools as shelters will not only take place but also more communities in Hawaii will be better prepared to take cover when the force of the next storm strikes.

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